Essays on Threat of Employee Mobility and Firm Countervailing Strategies

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Essay 1: Threat of Employee Mobility: Competitive Impact and Firm Patenting Strategy

Essay 2: Hello, Goodbye: Examining the Effect of Human Capital Mobility on New CEO Probation

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ESSAY 1 - Threat of Employee Mobility: Competitive Impact and Firm Patenting Strategy

Abstract

Inevitable disclosure doctrine (IDD) is an employer-friendly legal measure in the United States of America that aids employers in preventing employees from switching jobs to competitors if they would inevitably disclose trade secrets. Twenty-six states adopted IDD by the late 1990s. However, several states recognized the importance of employee mobility and rejected IDD in the past two decades. This essay relies on the staggered nature of these rejections and draws on the knowledge-based view of the firm to examine the effect of IDD rejection on three crucial phenomena. First, the knowledge leakage from employee mobility (enabled by IDD rejection) leads to an increase in competitive threats faced by firms. Second, the effect is amplified for firms with higher marketing investments, whereas R&D investments have no moderating impact. Third, firms respond to increased competitive threats by obtaining more process and product patents. Additional analysis shows that the business process and product patents mitigate the competitive threats faced by the firms.

Keywords: trade secrets, inevitable disclosure doctrine, product-market fluidity, business process patents, marketing assets

Introduction

Trade secrets are a significant source of competitive advantage for organizations. An EIU (2021) survey[1] shows that more than 75% of executives across industries (consumer goods, manufacturing, technology and media, energy and natural resources, finance, and life sciences) believe trade secrets are essential for creating value. Trade secrets are not just technical information but include knowledge about a firm's processes and routines. The Uniform Trade Secrets Act (UTSA) states a trade secret as "information, including a formula, pattern, compilation, program, device, method, technique, or process that (a) derives independent economic value, actual or potential, *from not being generally known to, (persons outside the firm)* and (b) not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use[2]." From a marketing perspective, trade secret protection includes marketing strategies, advertising and distribution strategies, pricing guidelines, packaging plans, customer catalogues, historical buying information, and customers' preferences.[3]

CREATe.org and PricewaterhouseCoopers[4] (2014) estimate the cost of trade secret theft to be 1% to 3% of the U.S. GDP, suggesting the estimated losses to the U.S. economy ($18 trillion[5]) can be $180 billion to $540 billion. These estimates include only intentional trade secret thefts but not unintentional/unavoidable trade secret leakages. Such trade secret leakages occur

[1] "Open secrets? Guarding value in the intangible economy" (2021) is a survey of 314 senior executives located in France, Singapore, Germany, the United Kingdom, China, and the United States, and across six sectors: finance; consumer goods and retail; energy and natural resources; manufacturing; and technology, media, and telecommunications; life sciences. The report was commissioned by CMS and surveyed by The Economist Intelligence Unit.

[2] https://www.law.cornell.edu/wex/trade_secret

[3] Brocade Communication Systems Inc. v. A10 Networks Inc., 873 F.Supp.2d 1192 (N.D. Cal. 2012) and PepsiCo, Inc. v. Redmond (1995)

[4] Center for Responsible Enterprise and Trade (CREATe.org) and PricewaterhouseCoopers, "Economic Impact of Trade Secret Theft: A Framework for Companies to Safeguard Trade Secrets and Mitigate Potential Threats," 2014, https://create.org/resource/economic-impact-oftrade-secret-theft.

[5] U.S. economy was nearly $18 trillion in 2014.

because of employee mobility across the firms. Legal regulations play a critical role in determining how well a firm can protect its trade secrets. Inevitable disclosure doctrine (IDD) is an employer friendly legal doctrine to protect a firm's trade secrets by limiting employee mobility. The premise of IDD is that due to the difficulty of compartmentalizing trade secret knowledge, employees, when joining another firm, including a competitor, will "inevitably" disclose trade secrets[6]. Specifically, if an employer could make a case that it would not be feasible for an employee to accomplish their job (with the new employer) without inexorably disclosing the trade secrets; the employee could be constrained from joining the new employer. Moreover, IDD does not require proof of actual violation to initiate action against the employee; a possible violation is sufficient.

Pepsico, Inc. vs. Redmond (1995), a critical case in IDD history that broadened the scope of IDD application to include not just technical information but marketing related knowledge of the firm, serves as a good illustration of the application of the "inevitable disclosure" argument. In 1994, the Illinois district court prevented William Redmond, a former sports drinks manager at Pepsico, from working for its competitor Quaker. He had signed no non-compete agreement with Pepsico. Nevertheless, the court decided that Redmond's knowledge of PepsiCo's strategic plans regarding its marketing, pricing, and distribution interfered with his ability to make impartial decisions at Quaker.

Twenty-six states adopted IDD by the late 1990s. However, over the last two decades, many states realized the stringent nature of IDD in limiting employee mobility and began to reject IDD. Specifically, out of the 26 states that adopted IDD by the late 1990s, 16 states rejected it by 2019. Despite the relevance of repeal of the legal doctrine to marketing practice

6 A court ruling stated, "Equity has no power to compel a man who changes employers to wipe clean the slate of his memory." (Peerless Pattern Co. v. Pictorial Review Co., 132 N.Y.S. 37, 39 [App. Div. 1911] cited in Fisk, 2001, p. 494).

and theory, research examining the implications for marketing is absent. Previous literature in strategy and finance primarily focused on retaining the CEOs (Na 2020) and employees (Gao et al. 2018) after IDD rejection. However, the consequences of IDD rejection on competitive threats arising due to trade secret leakages have not been examined. The EIU (2021) survey shows that nearly 50% of the executives consider trade secret leaks through employees a threat to trade secret security. More than 50% regard loss of competitive advantage and business as the top consequence, and more than 20% believe decreased incentive to innovate as one of the significant implications.

This essay examines the effect of the threat of employee mobility i.e. IDD rejection on competitive threats and firm patenting strategy. It draws on the knowledge-based view of the firm (KBV) that postulates that employees create knowledge in the firm whereas organizations are responsible for coordination and integration mechanisms (Grant 1996). It is proposed that as employee mobility increases inevitably transfer of trade secret knowledge to competitors' increases. Competitors integrate this new knowledge to create competing products and processes, resulting in competitive threats. Given that this proposition assumes that there is a transfer of knowledge, KBV is employed to identify moderating factors that further support the relationship. Firms that generate greater (lower) *transferrable* knowledge are expected to experience stronger (weaker) effect. Specifically, the role of marketing and R&D investments is examined as they enable the firm's marketing and technical knowledge creation.

When faced with knowledge leakage and competitive threats, firms turn to building their knowledge bases and protecting them from appropriation to build and grow competitive advantage. Firms have to protect not only technical know-how but also marketing processes and methods. Fortunately for firms, since 1998, USPTO allows business methods to be patented

along with physical products. Therefore, this essay examines how firms strategically respond to increased competitive threats in terms of their business process and product patenting actions.

To address a gap in the marketing literature on trade secrets and the opportunity to ensure causal identification from a natural experiment, this essay focuses on the following questions:

1. *What is the impact of IDD rejection on competitive threats?*
2. *What role do marketing and R&D investments play in mitigating competitive threats?*
3. *How do firms react to competitive threats?*

Using a sample of 867 firms over a fifteen-year period (2005-2019) and leveraging the exogenous variation in employee mobility provided by IDD rejection, staggered difference-in-differences analysis is used to examine the consequences on competition and subsequent firm patenting actions. There are three notable findings. First, IDD rejection leads to increased competitive threats. Second, firms that have higher marketing investments experience a stronger competitive threat post IDD rejection. A similar result is not observed for R&D investment. Third, firms respond by increasing their business process and product patenting. Additional analysis finds that patenting activity leads to lowering of competitive threats in the future.

This essay makes four key contributions to theory and practice. First, it contributes to the sparse literature on trade secrets by examining the implications of weakened trade secret protection (IDD rejection) through a marketing lens. Theoretical as well as empirical literature in marketing is silent on trade secrets[7]. Lack of data on trade secrets is likely the driving factor. Trade secrets are private information that cannot be shared. Moreover, firms are unwilling to disclose cases of trade secret leakage as it can be detrimental to firm's value. Hence, this essay relies on exogenous variation in trade secret protection. This essay is one of the first studies in

[7] Search for the term 'trade secret' in the abstract, title or keywords of marketing journals (Journal of Marketing, Journal of Marketing Research, Journal of the Academy Of Marketing Science, Journal Of Public Policy & Marketing, Journal Of International Marketing) yields no results.

marketing to examine trade secrets. It shows that as trade secret laws shift from being employer friendly to employee friendly, competition faced by firms increase.

Second, while marketing investments decrease competitive threats (main effect of marketing investments), the increase in employee mobility puts such firms at greater competitive threats (moderating effect). While marketing investments build intangible largely immobile assets such as brand trademarks and customer relationships, marketing investments also build mobile assets namely marketing employee skills, competencies and know-how. When the possibility of employee mobility is high, higher marketing investments leading to greater employee competency can have negative consequences for the firm. However, the findings show that rather than reducing marketing investments, the strategy to protect the appropriability of marketing knowledge created within the firm mitigates the competitive threats. This counter-intuitive amplifying effect of marketing investment on competitive threats, and using process and product patenting to protect marketing knowledge and mitigate competition, are novel contributions of this research.

Third, this essay contributes to the literature on employee mobility in marketing. Employee mobility can have implications for competition, innovation, new product development, and finally firm performance. However, past literature has examined only the performance implications of mobility. Wang, Gupta and Grewal (2017) find that social capital enabled by the movement of top sales and marketing executives enhances firm performance. Shi et al. (2017) show that in a B2B context, sales representative turnover decreases revenues by 13%-18%. This study adds to this stream of literature by showing employee mobility enhances competitive threats.

Fourth, this essay contributes to the literature on patenting. While past research looks at firm (Ex: Aghion, Reenen, and Zingales 2013; Fang, Tian, and Tice 2014), and TMT characteristics (Ex: Lerner and Wulf 2007; Galasso and Simcoe 2011; Cummings and Knott 2018) to understand patenting patterns, this study shows that legal regulations influence firms to acquire more patents. Moreover, this study adds to the growing literature on business process patents. Prior studies examined the performance implications of business method patents in financial industry (Ex: Lerner 2002), technology, (Ex: Hall and MacGarvie 2010) or manufacturing and trade sectors (Chan et al. 2021). This essay shows that competitive threats and employee mobility act as antecedents to the firms following a strategy of investing in business process patents.

Conceptual Framework and Hypotheses

As knowledge is central to the propositions, knowledge-based view (KBV) of the firm is used to develop conceptual framework (see Figure 1). KBV considers knowledge to be strategically the most important resource of the firm. It postulates that individuals are responsible for knowledge creation, whereas organizations are responsible for enabling the integration of knowledge into goods and services and establishing coordination to achieve this (Grant 1996).

The KBV of the firm evolved from the resource-based view of the firm. Knowledge is a valuable, rare, and hard-to-imitate resource providing a competitive advantage to the firm (Barney 1991). Therefore, KBV views heterogeneous knowledge resources are the determinants of competitive advantage.The KBV takes a dynamic capabilities view of the firm focusing on knowledge creation, knowledge transfer, and organizational learning to build new knowledge.

Explicit and implicit knowledge are the two significant sources of knowledge individuals and firms can wield to achieve sustained competitive advantage. Explicit knowledge can be

easily expressed and recognized in the firm's records and systems. Trade secret knowledge related to formulas, methods, or distributional processes detailed and stored in the firm's system, falls under explicit knowledge. Implicit knowledge is tacit knowledge that is intangible and cannot be easily expressed by the employee or the firm possessing the information. Tacit knowledge is gained through experiential learning and routines by individual employees. Implicit knowledge, however, can sometimes be turned into explicit knowledge through articulation and documentation.

Main Effect Hypothesis: IDD Rejection and Competitive Threats

Literature on IDD finds that IDD rejection leads to an increase in employee mobility. Specifically, Klasa et al. (2018) find that employee mobility improves after the repudiation of IDD law. Supporting this observation, Chen et al. (2019) find that the weakening of employer friendly laws increases executive job-hopping, where an executive moves to a new employer every year or two. Studies examining the different hierarchies of employees, executives, or CEOs find similar observations. K Na (2020) finds that CEO's external opportunities increase as the CEO's know-how becomes more valuable to competitors after the repudiation of IDD law. Table 1 provides a summary of literature on IDD.

<Insert Table 1 here>

This essay examines the firm level implications of IDD rejection that enables greater employee mobility. The KBV argues that employees are responsible for knowledge creation. Employees not only create but also absorb the knowledge gained through the coordination and integration activities in the firm. Therefore, employees carry the knowledge they created during their former employment. When employees move to competitors, the implicit knowledge is likely to be disclosed to rival firms. Because IDD rejection weakens trade secret protection

considerably, explicit knowledge is also likely to be divulged to rival firms. The transfer of knowledge will erode the competitive advantage generated by it. Competitor firms will assimilate this new knowledge brought by the new employees with their existing knowledgebase to create new products and services that are better positioned, increasing the competitive threats faced by the firm. Therefore:

H_1: IDD rejection leads to an increase in competitive threats faced by the firm.

Examining Heterogeneity: The Mitigating or Amplifying Role of Marketing Investments

Marketing investments help build intangible and largely immobile assets such as brands and customer equity as well as movable assets such as marketing employee competencies. Brands enable firms to differentiate themselves from the competition and the brand's equity resides in consumer minds preventing appropriation by competition. Higher equity brands enjoy greater loyalty because they signal their trustworthiness and reduce customers' perceived risk and information costs (Erdem, Swait, and Valenzuela 2006; Dubé et al. 2008). Moreover, loyal consumer are less likely to change brands even when offered price discount or promotions (see Keller 1993; Klemperer 1995) and resist other forms of competitive blandishments for higher-equity brands (Raju, Unnava, and Montgomery 2009). More importantly, brand and customer equity largely rests with the firm, and employees cannot carry it to competitors.

Firm investments in marketing also help build the competencies of the marketing employees in the firm. Competency is the individual entity's skills, i.e. the ability of employees to create and absorb trade secret knowledge. Trade secret knowledge includes explicit (technical) information related to formulae, methods, and techniques and implicit (non-technical) information related to marketing activities, such as, customer relationship routines, product/ service go-to-market delivery and post-sales support processes. To elaborate, these could relate

to methods regarding implementing loyalty programs, techniques for detecting stock depletion, customer subscription models, and managing delivery operations etc. As firms spend more on marketing, the employees are endowed with the resources to create new marketing methods or processes. Further, employees are exposed to the firm's routines and records, such as technical notes, methods, and process documents. Repeated experiences for the firm's employees engender greater learning experiences. Firms with higher marketing intensity are likely to create greater knowledge in employees than firms that spend less. This knowledge can be transferred to other firms when employees switch firms. Therefore, the effect of IDD rejection on competitive threats is greater for firms that spend more on marketing.

H_2. The higher the marketing intensity of the firm, the greater the effect of IDD rejection on competitive threats.

Examining Heterogeneity: The Mitigating or Amplifying Role of R&D Investments

R&D investments, similar to marketing investments, enable the creation of new knowledge and absorption of existing knowledge in the firm. Employees involved in innovation can gain experience with the firm's routines, methods, and processes. Repeated exposure to such routines engenders greater learning experiences for the employees. However, knowledge created through R&D investments is often patentable. Patents are protected by strong IP regimes governed by federal laws. Competitors cannot copy them without facing severe consequences, and even with high mobility, employees cannot transfer this knowledge to competitors. Higher R&D investments result in more patents and heightened protection from knowledge leakage. Therefore, the positive effect of mobility on competitive threats is lower for firms with higher R&D investments.

H_3. The greater the R&D intensity, the lower the effect of IDD rejection on competitive threats.

Main Effect: IDD Rejection and Business Process and Product Patents

Organizational theorists view firms as open systems influenced by their operating environment. When IDD legal doctrines are enforced, employee mobility is discouraged, and hence it is costly for firms to gain competitors' knowledge by hiring their employees. As a result, firms do not have to commit resources to prevent knowledge leakage in the presence of such strong IP regimes. The ability to retain/appropriate the knowledge limits competitive threats and increases financial returns. In similar vein, trademark research shows that when IP regimes are stronger, firms face lower costs of monitoring and enforcing trademarks as infringers face higher costs (Jayachandran et al. 2013 ; Gilfoil 2005).

The rejection of IDD increases the misappropriability of trade secrets that are reflected in a firm's processes, routines and methods. As trade secret knowledge transfer to rivals, firms face competition, likely leading to lower returns from these knowledge assets. Strategic changes are made by firms, when firms face a threat of weakening of property rights (Campbell and Lindberg 1990). The focal firm's incentive to protect their knowledge and sustain competitive advantage increases. In other words, the threat of competition post IDD rejection encourages firms to seek other means of building advantage by encouraging activities that have higher appropriability. The appropriability of these knowledge assets (Teece 2000) is determined by IP rights namely patent protections. Because patents offer better protection of both marketing and R&D in knowledge assets compared to trade secrets, firms respond by increasing their patenting activity to protect the knowledge already created. Therefore, after IDD rejection, business process and product patents increase, and competitive threats act as a mediator.

H_{4a}. IDD rejection leads to an increase in business process patents.

H_{4b}. IDD rejection leads to an increase in product patents.

H_5. Competitive threats acts as a mediator between IDD rejection and patents.

Institutional Setting: Inevitable Disclosure Doctrine

Trade secret refers to "information (including a formula, pattern, compilation, program device, method, technique, or process) that: (a) derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use, and (b) is the subject of efforts that are reasonable under the circumstances to maintain its secrecy" (Uniform Trade Secrets Act, 1979). Trade secrets are not just technical information but include any tacit knowledge such as pricing strategies, advertising tactics, and sales practices.

Trade secret protection, unlike other intellectual property such as patents or trademarks, is largely governed by state laws which developed separately in each state. Uniform Trade Secrets Act (UTSA) was enacted to bring uniformity to trade secret laws in the states. UTSA provided common definition of trade secrets and misappropriation. It detailed injunctive relief available for trade secret protection when there is an actual or threatened misappropriation. Threatened misappropriation happens when a former employee with trade secret knowledge works for a rival firm in a comparable position and has the intent to disclose trade secrets. IDD is a legal doctrine arising from the notion of threatened misappropriation. It prevents employees from working for competitor organizations if the employee would *inevitably* disclose trade secrets to rival firms. The employee may have no intention to misappropriate trade secrets, but the trade secret knowledge acquired from previous firm cannot be erased from his/her memory. Thus, if his/her responsibilities at the new firm are very similar to the previous employment

he/she will inexorably use the trade secrets. To invoke IDD and obtain an injunction against the employee, a firm has to show that the employee possesses firm's trade secrets, she is inevitably likely to disclose them in her new employment, and it would lead to irreparable financial damage to the firm. It is critical to note that IDD offers protection when there is just a danger of significant financial consequence without having to establish actual offense by the employee. In this sense, it provides extensive power to employers but at the expense of employee mobility.

Employee contracts such as non-disclosure agreements (NDA) and covenant not-to-compete (CNC) contracts are also used to mitigate trade secret disclosure. NDAs prevent disclosure of confidential and sensitive information shared between the firm and the employee. They offer security after disclosure is proven and damage occurs. CNC contracts prevent employees from working for competitors or starting a competing firm for a certain period of time. CNCs, however, are usually limited to the state or a geographical part of a state in which the employee works (Malsberger 2004). IDD is similar to employee contracts but offers a more powerful tool to the employer. It offers protection ex-post without any ex-ante signed contract with the employer. Unlike NDA it protects a firm before financial damage occurs as it doesn't require proof of actual trade secret appropriation. IDD has no geographical limitations. Using IDD legal measure a firm can stop a worker from working for competitors in other states irrespective of the status of IDD in those states.

IDD legal doctrine is adopted or rejected at state level. Twenty six states adopted it in early 1990s. However, recently many states have begun to repeal the law. California repealed the doctrine in 2002 as it went against Californian law that generally forbids non-compete agreements[8]. Washington district court rejected the IDD law in 2012 arguing that IDD is basically enforcing noncompetition agreement of infinite duration, which is against Washington

[8] Whyte v. Schlage Lock Co. , No. G028382 (Ct. of App. of California 2002)

law. Similarly, other states repealed IDD law resulting in a staggered rejection of IDD. Table 2 lists the states along with the rejection years[9] (Na 2020). A total of 16 states rejected IDD by 2016. Virginia is the earliest state to reject IDD in 1999 and North Carolina is the latest state to repeal the law in 2014.

<Insert Table 2 here>

IDD provides a plausibly exogenous variation in employee mobility. First, decision of state courts is not influenced by firm level product market strategies. Second, the judges do not intend to affect competition in the market but aim to balance employer interests in protecting trade secrets with employee welfare providing employee mobility. Third, state laws regarding employee unions, labor laws etc., that are usually affected by lobbying from organizations or employees do not affect the adoption or rejection of IDD as judges are largely independent and judgement is based on the details of a particular case. Fourth, rejection of IDD cannot be expected by firms in advance. Precedent setting decision is determined by the specific aspects of the case (such as the nature of trade secrets, length of employment, and employee contracts in place) and the presiding judges.

Firms employ workers in multiple states apart from the headquarter state. Since IDD is at state level, the jurisdiction of IDD is the state in which the employee works i.e. firms can get an injunction against an employee in the state in which an employee works. While data restricts from identifying all the states of employment of an organization, I am only interested in employees who are exposed to a firm's trade secrets. I assume that employees and senior level executives working at headquarters are privy to firm's trade secret knowledge.

Sample and Measures

[9] Precedent setting legal case is used to define IDD rejection year for each state (Klasa et al., 2018). Refer to online appendix of Flammer and Kacperczyk (2019) for a list of the cases used to define IDD rejection year until 2013. I obtain the list of rejection years from K Na (2020) as data extends until 2019.

To construct my sample, I merge the databases of COMPUSTAT and ExecuComp with product market fluidity data (a measure of competitive threat) from Hoberg-Phillips Data Library and IDD rejection data (Na 2020). COMPUSTAT contains firm and accounting level financial information. ExecuComp database contains data on the compensation of the top five[10] highest paid executives of firms in the S&P 1500 index and serves as a source of the top management team (TMT) data. I merge the two databases and obtain a sample of S&P 1500 firms for the last fifteen years i.e. 2005 to 2019.

I combine this data with firm headquarters data from COMPUSTAT. I further merge this data with IDD rejection data (Na 2020) shown in Table 2 using headquarter state. Table 2 provides data on U.S. states, state codes and corresponding IDD rejection dates. I integrate this data with product market fluidity data. Hoberg-Phillips Data Library provides fluidity data from 1989 to 2019 which is updated each year. Finally, after discounting observations with missing information, I have a final sample of S&P 1500 firms with 7,174 firm-year observations from 2005-2019.

Dependent Variable: Competitive Threats

Herfindahl–Hirschman Index (HHI) is a traditional measure of competition frequently employed in previous studies. HHI is an industry level competition measure that that takes the same value for all firms in a given industry. However, Firms in the same industry don't necessarily face the same level of competition (Hoberg and Phillips 2016). This research requires a firm level competition measure that is unique to each firm. Moreover, HHI responds slowly to economic changes. Movements in a firm's product market strategy are not immediately reflected in HHI until the change translates to a change in revenues. When employee mobility increases, trade

[10] ExecuComp collects up to nine executive's data depending upon the disclosures in the proxy statements though most companies report only top five executive's data.

secrets of firms are likely revealed. This can result in a change in product offerings, product features, or some part of the product market strategy. Therefore, I require an ex-ante sensitive measure of competition at firm level.

Product market fluidity is an ex-ante measure of competitive threat constructed and validated by Hoberg, Phillips, and Prabhala (2014). It is a text based measure constructed using business descriptions in annual 10-K forms. SEC mandates that firms provide an accurate description of the products and services in 10-K forms. Fluidity measures the changes in the rival firms' product description words that coincide with focal firm's product vocabulary. Change in the focal firm's product words suggests movement by competitors in its product market. The ability of competitors to move in the focal firm's product market space is regarded as competitive threats to the focal firm (Hoberg, Phillips, and Prabhala 2014). The measurement is described below.

Let N_t be the total count of unique words in the business description by all the firms in time period t. Let $\mathbf{W_{it}}$ be a Boolean vector of length N_t where elements represents if the N_t unique words are employed by firm i in time period t. Value of an element 'n' in $\mathbf{W_{it}}$ is equal to one if the corresponding word is employed by firm i in time t, zero otherwise. Change in the total word usage of N_t words in year t is given by the aggregate vector as

$$\mathbf{D_{t-1,t}} \equiv \left| \sum (\mathbf{W_{n,t}} - \mathbf{W_{n,t-1}}) \right|$$

Product market fluidity is then defined as cosine similarity between firm i's product word usage vector $\mathbf{W_{it}}$ and the total change in competitors' word usage vector $\mathbf{D_{t-1,t}}$.. In other words, product market fluidity of a firm i at time period t is dot product of its own product word usage

vector $\mathbf{W_{it}}$ and the total change in word usage vector $\mathbf{D_{t-1,t}}$ where the two vectors are normalized[11]. It is written as

$$\textbf{Product market fluidity}_{it} \equiv \mathbf{W_{it}}.\mathbf{D_{t-1,t}}/||\ \mathbf{W_{it}}||*||\mathbf{D_{t-1,t}}||$$

Thus, the dot product captures competitor response to the focal firm's product market space. Since the two vectors $\mathbf{W_{it}}$ and $\mathbf{D_{t-1,t}}$ are positive and normalized, fluidity lies between zero and 1.

The empirical construct product market fluidity has been validated by Hoberg, Phillips, and Prabhala (2014) in several ways. First, they show that firms with high fluidity i.e. firms with fluid product markets have substantially higher cash holdings to respond to the greater competitor response they face. Second, analyzing the transition matrices of product market fluidity i.e. explaining future fluidity as a function of initial fluidity over a one, three and six year periods shows that firms move to stable product markets than fluid markets consistent with product life cycle theories. Third, to provide an external validation on competitive threats, Hoberg, Phillips, and Prabhala (2014) examine the relationship between fluidity and threats from Venture Capital (VC) backed firms and IPO firms. They find that there is a significant and a positive correlation between the two showing fluidity reflects threats from rivals.

Dependent Variable: Business Process Patents and Product Patents

USPTO allows business processes (methods) to be patented following the *State Street Bank & Trust Co. v. Signature Financial Group, Inc.* case in 1998. Business processes can be patented if they produce a concrete, tangible and useful result. I further classify the business process patents into three categories namely customer targeting, distribution, and support services following Chan, Bharadwaj, and Varadarajan (2021). Table 3 provides examples of business process patents. I treat the patents that are not business process patents as product patents.

[11] Refer to Appendix for a detailed example of measuring product market fluidity.

<Insert Table 3 here>

Moderating Variables

I examine the role of two moderators' namely marketing and R&D investments. Marketing and R&D investments are measured as advertising (Xiong and Bharadwaj 2013) and R&D expenses (Tang, Li, and Yang 2015) divided by total assets, respectively.

Control Variables

IDD provides an exogenous variation in trade secret protection. Klasa et al. (2018) find that state level factors related to labor laws, labor unions, economic and political conditions or workforce demographic do not influence IDD adoption. While state level aspects do not affect judiciary decisions which are independent, for robustness I account for such effects and control for firm fixed effects which subsume state level fixed effects[12]. I also control for time fixed effects to account for unobserved economic and global factors that may impact all the firms.

I control for firm characteristics that may affect fluidity. I follow Hoberg, Phillips and Prabhala (2014) in the choice of control variables. I control for firm size measured as the natural logarithm of total number of employees in thousands. I control for *Return on assets (ROA)* as more profitable firms can erect higher entry barriers affecting competitive threats (Hoberg, Phillips, and Prabhala 2014). Similarly, I control for firm leverage. *Firm Leverage* is the ratio of total debt i.e. sum of long term debt (dltt) and debt in current liabilities (dlc) to the book value of total assets (at). I also control for TMT characteristics as they could influence product market strategy (Yim 2013) and competition of the firm (Niederle and Vesterlund 2011). *TMT size* is the natural logarithm of total number of executives on the TMT of a firm in a year as obtained from ExecuComp. *TMT average age* is the average age of total number of executives on the TMT.

[12] While firm level effects are unlikely to influence IDD rejection we add them for robustness and efficiency precluding us from additionally including additional state and industry level effects.

TMT gender pt is the percentage of female TMT members on the TMT. *TMT equity pay* is the average of the ratio of equity pay to total pay of all TMT members. *CEO age* is the age (AGE) of the CEO obtained from ExecuComp. *CEO gender* is an indicator variable equal to 1 for women and 0 for men. Table 4 provides a summary of the variables used in analysis.

<Insert Table 4 here>

Methodology: Staggered Difference-in-differences

I use a staggered difference-in-differences[13] model to test the hypotheses (Angrist and Pischke (2009). IDD is rejected by different states at different time periods providing with staggered variation in treatment. Treatment group units are firms located in states where IDD is rejected and control group units are firms in IDD not rejected states[14]. Thus, the use of a staggered difference-in-differences (DID) method to estimate the effect of IDD rejection on competitive threats faced by the focal firm is appropriate.

I follow the following steps. First, I estimate the effect of IDD rejection on competitive threats (H_1) and the moderating effect of marketing (H_2) and R&D investments (H_3). Second, I test the effect of IDD rejection on business process patents (H_{4a}) and product patents (H_{4b}). Finally, I test if competitive threats mediate the relationship between IDD rejection and patents.

I use the following two-way fixed effect DiD specification to test H_1:

$$CT_{it} = \alpha_i + \lambda_t + \beta_0 + \beta_1 IDD_{it} + \beta_2 X_{it-1} + \epsilon_{it} \quad (1)$$

where

CT_{it} indicates competitive threats of firm i in year t (measured as product market fluidity);

[13] Baker, Larcker and Wang (2022) suggest that researchers report the percentage of never-treated units in the sample when using TWFE staggered DiD model. Sample contains >40% of never treated units indicating a low degree of potential bias.

[14] Control groups include both, states where IDD is adopted and states where there is no ruling on IDD.

IDD_{it} is an indicator variable equal to one for firms headquartered in states where IDD is rejected and 0 otherwise;

X_{it-1} captures the control variables (Firm size, ROA, Firm leverage, TMT size, TMT average age, TMT gender percent, TMT equity pay, CEO age, CEO gender);

α_i are firm fixed effects;

λ_t are year fixed effects, and

ϵ_{it} is the error term capturing the unexplained variation in competitive threats.

The coefficient of IDD (β_1) provides the DiD estimate of the effect of IDD rejection on competitive threats. To test H_2 and H_3, I interact IDD with marketing investments and R&D investments. Similarly, I test H_{4a}, H_{4b}.

$$BPP_{it} = \alpha_i + \lambda_t + \beta_0 + \beta_1 IDD_{it} + \beta_2 X_{it-1} + \epsilon_{it} \quad (2)$$

$$PP_{it} = \alpha_i + \lambda_t + \beta_0 + \beta_1 IDD_{it} + \beta_2 X_{it-1} + \epsilon_{it} \quad (3)$$

BPP_{it} indicates business process patents of firm i in year t;

PP_{it} indicates product patents of firm i in year t;

X_{it-1} captures the control variables (Firm size, ROA, Leverage, Marketing and R&D expenses, Capital to labor ratio, TMT size, TMT average age, TMT gender percent, TMT equity pay, CEO age, and CEO gender).

Results and Robustness Checks

I present the results of test of hypothesis H1, H2 and H3 in table 5. I estimate 'Model 1' to test the main effect of IDD rejection on competitive threats and 'Model 2' to test the moderating effects of marketing and R&D investments. Model 1 shows that IDD rejection leads to an increase in competitive threats (β=0.258, $p<.05$) supporting H1. Model 2 shows that marketing

investments have a positive moderating effect (β=2.223, p<.05) supporting H2 whereas R&D investments have no moderating impact (β=-3.308, p>.1).

<Insert Table 5 here>

I show the results of estimation of the effect of employee mobility on business process patents in Table 6. Business process patents consists of three categories, namely customer targeting, product delivery and post sales services. I find that IDD rejection leads to an increase in business process patents overall (β=0.12, p<.05) supporting H4a. Further, at the disaggregate level, I find that IDD rejection increases customer targeting patents (β=0.13, p<.05) and product delivery (β=0.11, p<.05) patents, but not post sales services patents (β=0.12, p>.1). Results from Table 6 show that employee mobility increases product patents (β=0.19, p<.05) in line with H4b.

<Insert Table 6 here>

<Insert Table 7 here>

In Table 7, I present the results from testing competitive threats as a mediator for the effect of IDD rejection on patents. I follow the guidelines of Zhao, Lynch Jr and Chen (2010) to test mediation. First, I test the following: (a) the effect of IDD rejection on competitive threats, (b) the effect of Competitive threats on business process and product patents after controlling for IDD, and (c) the effect of IDD rejection on business process and product patents after controlling for competitive threats. In Table 5, I test the effect of IDD rejection on competitive threats (β=0.258, p<.05). In Table 7, I test and find that competitive threats has a positive effect on business process (β=0.08, p<.05) and product patents (β=0.13, p<.05) after controlling for IDD rejection. In Table 7, I test and show that IDD rejection has a positive effect on business process (β=0.11, p<.05) and product patents (β=0.19, p<.05) after controlling for competitive threats. I find that effects axb and c are significant and positive. Therefore, as outlined by Zhao, Lynch Jr

and Chen (2010), this indicates a complementary mediation. This implies hypothesis H_5 identifying competitive threats as a mediator is correct. However, there may be omitted mediators in the direct path that can be explored in future research.

Robustness Checks

I conducted the following tests to ensure the robustness of results. First, I tried multiple measures of marketing investments. In the main model, I used advertising investment divided by total assets as a measure of marketing investment. I employed alternate measures of marketing investment namely SG&A divided by total assets, SG&A divided by sales, advertising investments divided by sales. Model is robust to these alternate measures.

Second, in the main model I dropped observations that don't report advertising and R&D investments. Instead of dropping, I assigned the firms that don't report these expenses the value zero. Model is robust to this specification.

Third, I run full model 2 that estimates the effect of IDD rejection on competitive threats and model 3 that examines the effect of IDD rejection on business process patents as system of equations. Similarly Irun model 2 and model 4 as a system of equations. Results are directionally similar.

Additional Analysis

For the sake of completeness, I examined if the strategy by firms to increase the appropriation of their knowledge assets by patenting mitigates competitive threats in the presence of employee mobility regime (IDD being rejected). To do so, I examined if the increase in patents has an effect on competitive threats in the next period (t+2). I present the results of analysis in Table 8. The results indicate that both business process patents (β=-0.27, $p<.05$) and product patents (β=-0.34, $p<.05$) reduce competitive threats in the t+2 period.

<Insert Table 9 here>

Discussion

While there has been some research on employee mobility (Wang Gupta and Grewal 2017) and on knowledge transfer between firms (e.g., Srinivasan, Wuyts and Mallapragada 2018; Prabhu, Chandy and Ellis 2005) prior studies have not connected these streams. Nor has this research explored the competitive implications and firm strategic responses. I situate this research on this intersection and draw on the knowledge based view of the firm and exploit a staggered law change across states to test the effect of employee mobility on competitive threats. I also examine the role of marketing investments and firms' coping strategy using business (marketing) process and product patents to mitigate competitive threats.

Theoretical Implications

Expand marketing's understanding of trade secrets. Trade secrets are not only technical information but also marketing knowledge related to methods, processes and techniques. Trade secrets are an important source of competitive advantage for any firm. However, owing to private nature of such information and the lack of publicly available data on trade secrets, the literature on trade secrets is sparse. This essay expands marketing's understanding of trade secrets in two ways. First, I show that IDD rejection leads to enhanced competitive threats with the theoretical mechanism being trade secret knowledge spillovers. I present further evidence of knowledge spillover through a novel moderating mechanism; with marketing investments, an antecedent to marketing knowledge, serving as a moderator leading to greater competitive threats.

Second, prior literature on trade secrets largely focuses on retaining employees by changing compensation schemes (Na 2020) or upward earnings management (Gao et al. 2018) to

preserve trade secret knowledge. This essay introduces a third approach, namely enhancing knowledge approriability by increasing business (marketing) process and product patents in the presence of greater employee mobility.

Explore the relationship between employee mobility and marketing phenomenon. Employees are a significant asset of any organization responsible for marketing knowledge creation (Barney 1991). Acqui-hiring, i.e., gaining new employees through acquisitions significantly alters the landscape of marketing knowledge within the firm (Prabhu, Chandy and Ellis 2005). Therefore, it is imperative to understand the effect of employee mobility on marketing outcomes. However, employee mobility literature is largely confined to the domains of economics, strategy and organizational behavior. It shows that mobility has significant implications for both source and destination firms (Mawdsley and Somaya 2016). The role of marketing assets, implications for marketing outcomes and mobility of marketing executives is yet to be explored. Wang, Gupta and Grewal (2017) is one of the limited papers on employee mobility in marketing literature. They focus on the mobility of top marketing and sales executives in B2B and the effect of resulting social capital on firm performance.

In this research, I examine two marketing outcomes, competition and patents (product patents and marketing business process patents). I show that employee mobility, facilitated by IDD rejection, increases competitive threats for firms, and those firms respond by increasing their business process and product patents. Further, Contigiani et al. (2018) shows that IDD *adoption* leads to decrease in patenting as employee incentives to signal ability to the labor market is lower. I show that after IDD rejection, patenting increased for both products and processes. Moreover, I show a novel mechanism that firms engage in higher patenting as a response to competitive threats. I find that patenting activity increases immediately after IDD

rejection (one time period (one lagged)), indicating that firms are endeavoring to protect knowledge already created in the firm.

The herfindal index (HHI) is used as a traditional measure of competition in marketing. However, it is industry specific and slow to change thus not reflecting competitive dynamism. This essay introduces product market fluidity as a new measure of competition relatively novel to marketing literature[15]. This measure is both firm specific and reflects dynamism as warranted.

Managerial Implications

This research suggests the following practices to protect their trade secrets.

Train managers on trade secret protection measures. Trade secrets are a critical source of competitive advantage. Loss of trade secrets has expensive implications for a firm. I show that employee mobility has immediate consequences for a firm -trade secret knowledge spillover and increased competitive threats. Given that trade secret protection can be affected by economic (employee mobility) or legal (IDD rejection) changes, firms ought to be prepared to protect their trade secrets. However, the EIU (2021) survey informs that more than thirty percent of senior executives consider lack of experience or awareness of trade secrets an obstacle for trade secret protection. Educating managers on trade secret definition and trade secret value; the company policies related to trade secret protection such as data access, data transfer and usage of mobile devices; usage of knowledge management systems in the firm; and the legal measures and laws available at the state and federal level should be the first step in protecting trade secrets. It is the easiest and most inexpensive way to safeguard them.

Protect marketing knowledge. I find that the effect of mobility on competitive threats is higher for firms with higher marketing investments. Firms that spend higher on marketing create greater knowledge in their employees and higher exposure to firm's processes and methods. A

[15] Panagopoulos et al., (2018) recently used it as a moderator and measure of competition.

firm cannot prevent an employee from switching to a competitor and with IDD rejection cannot easily protect itself from knowledge spillovers. This research suggests that firms respond by increasing their patenting activity converting the employee's implicit knowledge to explicit knowledge. Knowledge management systems is another tool firms can employ to convert implicit knowledge of employees to explicit. Knowledge management systems are software (e.g., Document360, Zoho Wiki, Bitrix24) that facilitate knowledge storage and sharing between team members, teams, and firm and customers. Employees in a team can share their implicit knowledge by writing process documents, white paper or process manuals. Employers can track knowledge in their teams; identify certain knowledge as trade secret; and take measures to protect trade secrets by restricting access.

Public Policy Implications

This study also provides learnings for public policy experts that warrant further examination. I find that IDD rejection leads to more competition in the market. It is well known that higher competition leads to better prices and higher quality products for consumers and spurs innovation in the industry. Trade secret protection is beneficial to firms in providing competitive advantage but a weakened regime maybe beneficial to customers. This tradeoff is important for policy makers to bear in mind.

Future Research

This essay shows there is greater scope for marketing researchers to understand marketing implications of employee mobility. Future researchers could investigate the effect of employee mobility on marketing executive compensation, myopic marketing management, or strategic emphasis between knowledge creation and appropriation. USPTO allows business methods to be patented since 1998. Unlike product patents that protect a physical object, business process

patents protect a method or a process relying on existing technologies. The subclass descriptions of customer targeting, distribution and support services patents indicate that these patents are essentially marketing patents. Given the marketing nature of these patents, it is important for marketing researchers and marketers to understand the antecedents and consequents of marketing business method patents.

Limitations

As with any empirical study, this research has some limitations. First, this study assumes that trade secrets are held by executives working at a firm's headquarters. However, there might be workers with trade secret knowledge working from other state locations of the firm. This limitation stems from lack of reliable data sources on operating locations of a firm. Second, although this essay provides strong evidence that IDD rejection increases competitive threats and identifies two moderators that provide evidence for the mechanism, it does not examine mediating factors. This arises due to the difficulty in gathering data on the internal workings and knowledge exchange inside a firm.

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Table 1. Review of the IDD Literature

IDD Papers	Findings	DV	Moderator
Klasa et al. (2018)	Firms increase their leverage when they face greater competitive threat because of potential loss of trade secrets to rivals	Leverage	Human capital importance (% workers in managerial occupations in the industry, average distance to rivals) , Rivals financial strength (average rating of rivals), asset specificity, Industry barriers (Industry advertising and R&D)
Flammer and Kacperczyk (2019)	Following IDD rejection, firms increase CSR expenses as it can enhance employee loyalty and reduce the risk of trade secret disclosure even after employee turnover	CSR (KLD index)	NA
Na, K. (2020)	Firms link CEO pay with systematic performance to reduce turnover as CEO's outside opportunities increase after IDD rejection	CEO relative performance evaluation	Labor market mobility(retirement, founder CEO,external hiring, industry heterogeneity), Propriety info(High/low tech industry, Industry Patents), Corporate governance (Chair,EIndex)
Gao et al. (2018)	Following IDD rejection/adoption firms increase/reduce upward earnings management as a means to retain employees	Earnings management	Human capital importance (Intangible assets intensity, % of knowledge workers,% of inventors), Labor market mobility(defined benefit pension plan, number of peers)
Chen et al. (2020)	After IDD adoption, labor market mobility is poor and so likelihood of acquisition increases to gain access to valuable human capital	Acquisition	Human capital importance (% of knowledge workers, R&D), Labor market mobility(number of rivals, option grant)
Contigiani et al. (2018)	IDD adoption leads to decrease in patent output as employee incentive to signal to market decreases	Patents	NA
This essay	***IDD rejection increases competitive threats. Firms with higher marketing investment experience higher threats compared to firms with lower marketing investments. Firms respond to competition by increasing business process and product patents.***	**Competitive threats (Product market fluidity) Business process and product patents**	**Marketing and R&D intensity**

Table 2. State Wise Rejection Year of The Inevitable Disclosure Doctrine

State Code	State	Year
VA	Virginia	1999
FL	Florida	2001
CA	California	2002
MI	Michigan	2002
TX	Texas	2003
MD	Maryland	2004
OH	Ohio	2008
AR	Arkansas	2009
NY	New York	2009
WI	Wisconsin	2009
NH	New Hampshire	2010
MA	Massachusetts	2012
NJ	New Jersey	2012
WA	Washington	2012
GA	Georgia	2013
NC	North Carolina	2014

Table 3. Examples of Business process patents categorized into customer targeting, product delivery and support services

Patent Number	Patent Title	Assignee Name
	Customer Targeting	
8744929	Services for supporting customers to share information regarding their E-commerce transactions	Amazon.com, Inc.
8732011	System for executing a performance-based referral program for customers	Amazon.com, Inc.
8015088	Methods for implementing a loyalty program	The Coca-Cola Company
6047268	Method for billing for transactions operated over the internet	AT&T Corp
8554691	Sale of footwear by subscription	Nike Inc.
	Product Delivery	
8756113	Methods for automating access to shipping services	United States Postal Service
9031872	Digital sign with incorrectly stocked item identification	Target Corp
9015072	"Method and apparatus for automated inventory management using depth sensing"	Xerox Corp
8996413	Techniques for detecting depleted stock	Walmart Inc.
7292989	Method and system for managing carrier operations	Ford Motor Co.
	Support Services	
8959121	Accessible and updateable service records	AT&T Inc.
8423478	Preferred customer service representative presentation to virtual universe clients	International Business Machines Corp
6594644	Electronic gift certificate system	Amazon.com, Inc.
8799122	"Method and system for user contributed aggregated fraud identification"	Intuit Inc.
8706576	"System, method and computer program product for performing one or more maintenance tasks on a remotely located computer connected to a server computer via a data network"	McAfee Inc.

Table 4. **Summary of Variables, Measures and Data Sources**

Conceptual Variable	*Measured Variable*	*Data Source*
Dependent Variables		
Product market fluidity	A text based measure of competitive threats constructed and validated by Hoberg, Phillips and Prabhala (2014).	Hoberg, Phillips and Prabhala (2014)
Business process patents	USPTO provides business process patents under 'Class 705.'	USPTO
Product Patent	USPTO provides patent data	USPTO
Independent Variable		
IDD Rejection	An indicator variable equal to one for firms headquartered in states where IDD is rejected and 0 otherwise.	
Moderating Variables		
Advertising intensity	Advertising expenses divided by total assets	COMPUSTAT
R&D intensity	R&D expenses divided by total assets	COMPUSTAT
Control Variables		
Firm size	Natural logarithm of total number of employees (log(1+emp))	COMPUSTAT
ROA	Ratio of net income to total assets (ni/at)	COMPUSTAT
Firm leverage	Ratio of debt (long term debt and debt in current liabilities) to total assets (dltt+dlc/at)	COMPUSTAT
TMT size	Natural logarithm of total number of TMT members	ExecuComp
TMT average age	Average age of TMT members	ExecuComp
TMT gender percent	Percentage of female TMT members in the TMT	ExecuComp
TMT equity pay	Average of the ratio of equity pay (before 2006 – RSTKGRNT and opt_ OPT_EXER_VAL, after 2006 - STOCK_AWARDS_FV and OPT_EXER_VAL) to total pay (tdc2) of all TMT members.	ExecuComp
CEO age	Age of the CEO	ExecuComp
CEO gender	An indicator variable equal to 1 for women and 0 for men.	ExecuComp

Table 5. IDD Rejection and Competitive Threats

DV – Competitive Threats	Expected Direction	Model 1	Model 2
IDD Rejection	H1 (+)	0.258**	0.329**
		(0.123)	(0.139)
MKT		-1.324**	-3.230***
		(0.652)	(1.175)
IDD*MKT	H2 (+)		2.223**
			(1.027)
R&D		1.357	3.552*
		(1.093)	(2.066)
IDD*R&D	H3 (-)		-3.308
			(2.061)
Firm Size		-0.037	-0.031
		(0.115)	(0.114)
ROA		-0.219	-0.255
		(0.245)	(0.244)
Firm Leverage		0.237	0.251
		(0.216)	(0.213)
TMT size		-0.024	-0.031
		(0.120)	(0.120)
TMT average age		-0.015*	-0.015*
		(0.008)	(0.008)
TMT gender percent		0.000	-0.000
		(0.002)	(0.002)
TMT equity pay		-0.009	0.002
		(0.119)	(0.119)
CEO age		0.005	0.005
		(0.006)	(0.006)
CEO gender		0.268	0.257
		(0.243)	(0.244)
Firm and Year FE		Yes	Yes
Number of gvkey		867	867
Observations		7,174	7,174
R-squared		0.15	0.15

Note:Robust standard errors in parentheses.*** p<0.01, ** p<0.05, *p<0.1

Table 6. IDD Rejection and Business Process Patents and Product Patents

(t+1)	Business Process Patents (Model 3)	Business Process Patents			Product patents (Model 4)
		Customer Targeting	Product Delivery	Post Sales Services	
IDD Rejection	0.12**	0.13**	0.11**	0.12	0.19**
Control Variables	Yes	Yes	Yes	Yes	Yes
Firm and Year FE	Yes	Yes	Yes	Yes	Yes
Number of gvkey	800	800	800	800	800
Observations	5,070	5,070	5,070	5,070	5,070
R-squared	0.18	0.18	0.18	0.18	0.21

Note: Results are for one-tailed tests. I control for firm size, ROA, leverage, marketing and R&D expenses, capital to labor ratio, TMT age and CEO age. (Kim and Marschke, 2005).
Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7. Mediation Model of IDD Rejection And Patents

	Competitive Threats	BP Patents (t+1)	Product Patents (t+1)	BP Patents (t+1)	Product Patents (t+1)
IDD Rejection	0.258**	0.12**	0.19**	0.08**	0.13**
Competitive Threats				0.011**	0.019**
Control Variables	Yes	Yes	Yes	Yes	Yes
Firm and Year FE	Yes	Yes	Yes	Yes	Yes
Number of Firms	867	800	800	800	800
Observations	7,174	5,070	5,070	5,070	5,070
R-squared	0.15	0.18	0.21	0.18	0.23

Note: Results are for one-tailed tests. I control for firm size, ROA, leverage, marketing and R&D expenses, capital to labor ratio, TMT age and CEO age. (Kim and Marschke, 2005).
Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8. Additional analysis – Patents on competitive threats

DV – Competitive Threats (t+2)			
BP Patents	-0.42**		-0.27**
	(0.132)		(0.142)
Product Patents		-0.46**	-0.34**
		(0.121)	(0.132)
Control Variables	Yes	Yes	Yes
Firm and Year FE	Yes	Yes	Yes
Number of gvkey	800	800	800
Observations	5,070	5,070	5,070
R-squared	0.18	0.18	0.18

Note: Results are for one-tailed tests.
Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
In 2015 USPTO started following the cooperative patent classification (CPC) system where the business method (705) category is split into multiple categories and combined with other groups. So, I use the 2005-2014 data for the analysis.

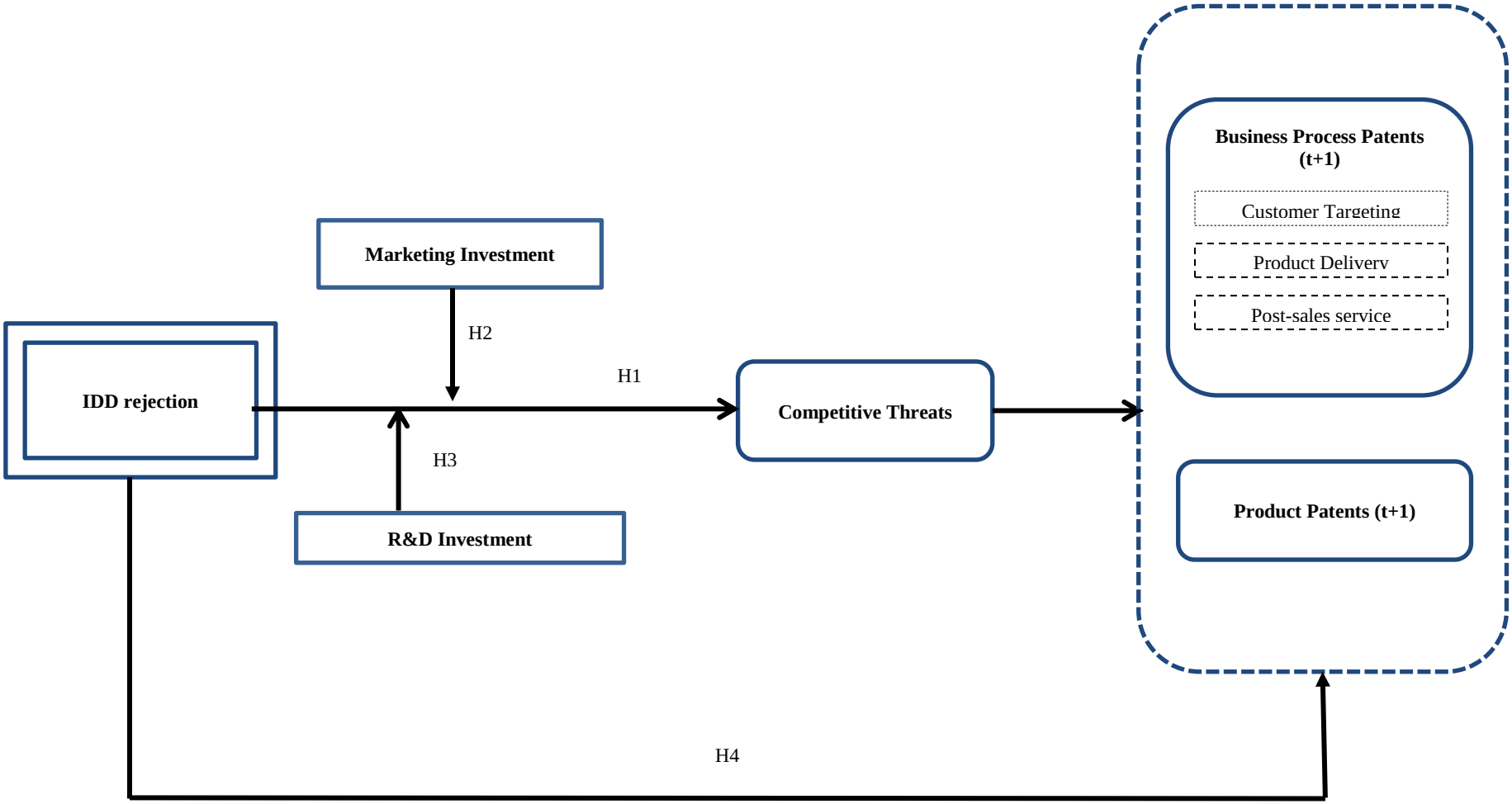

Figure 1 Conceptual Model

ESSAY 2 - Hello, Goodbye: Examining the Effect of Human Capital Mobility on New CEO Probation

Abstract

CEO succession is one of the most uncertain times in the life of an organization. There is considerable research in predicting if a new CEO probation period is successful (CEO-board chair consolidation), or failure (e.g., early CEO dismissal). However, there is limited theoretical and empirical work on understanding what affects the duration of the CEO probation period. This essay draws on research in human capital and employee mobility to argue that boards extend the CEO probation periods (withhold the chair title from the CEO longer) when there is higher likelihood of CEO turnover to mitigate the turmoil and cost associated with frequent CEO succession. I rely on a natural experiment where U.S. state courts repealed Inevitable Disclosure Doctrine (IDD) which exogenously increased employee (CEO) mobility. To test the hypothesis, I use survival analysis and a sample of S&P 1500 firms from 2007-2019. I find that IDD rejection leads to an increase in the time to board chair of the CEO. Consistent with theory, I find that this relationship weakens with industry concentration and strengthens with firm performance, factors that affect the CEO's likelihood of leaving for a competitor.

Keywords: CEO probation, inevitable disclosure doctrine, CEO mobility, CEO-board chair, CEO succession

Introduction

One of the most uncertain periods in the life of a corporation is the period immediately following a CEO succession (Bennis & O, 2000; Berns & Klarner, 2017; Wiersema, 2002). A new CEO often promotes strategic change, with ambiguous implications for firm performance (Karaevli, 2007; Zhang & Rajagopalan, 2010). A change in CEO also often precipitates turnover in the rest of the executive team (Andrus et al., 2019), potentially ushering in considerable upheaval and uncertainty (Messersmith et al., 2014). However, when boards of directors hire new CEOs, they often do so with only minimal knowledge about the individual (Graffin et al., 2013; Zhang, 2008), especially as the practice of placing CEO heirs apparent on boards prior to their appointment has fallen out of favor (Joseph et al., 2014). In one extreme example, Hewlett-Packard hired Leo Apotheker as CEO without a majority of the board even having met him; the board dismissed Apotheker 11 months later (Stewart, 2011).

Given the uncertainty surrounding a CEO succession event, boards often withhold some responsibilities—and authority—from new CEOs in the early period of the CEO's tenure (Chen et al., 2015; Shen, 2003; Vancil, 1987). Though the particulars of this probationary period differ across firms and institutional contexts, in the U.S. the most visible manifestation once an individual is officially appointed CEO is the temporary withholding of the additional title of board chair from that individual (Brickley et al., 1997; Krause & Semadeni, 2013; Quigley & Hambrick, 2012).[16] Delaying CEO duality (i.e., the combination of the CEO and chair roles) for a new CEO serves dual purposes for the board. It supports the development of the CEO's leadership by leaving him or her free to focus on learning the organization and building its

[16] Scholars have examined other manifestations of CEO probation, such as interim CEO appointment (Chen et al., 2015) or heir apparent designation (Zhang & Rajagopalan, 2004), however these reflect probation periods during which the board decides whether to officially hire the individual as CEO. Once the CEO is officially hired, the withholding of the board chair title is among the most visible indicators of CEO probation.

strategy without having to manage board responsibilities (Krause & Bruton, 2014; Lorsch & Zelleke, 2005), while at the same time managing the firm's risk by not investing total power and responsibility in an individual who might soon leave the organization (Brickley et al., 1997). Between 2004 and 2018, nearly half of all CEO turnover events occurred within five years of the CEO's appointment (Karlsson et al., 2019).

Though scholars have devoted considerable attention to predicting whether a CEO's probationary period will be successful (e.g., resulting in CEO-chair consolidation; Krause & Semadeni, 2013) or unsuccessful (e.g., resulting in early CEO dismissal; Graffin et al., 2013), there remains limited theoretical basis for predicting the *duration* of the probation period, or whether the board imposes a probation period at all. Some CEOs are brought in as board chair immediately, some wait a year or two years to be named chair, and others never become chair, either because they are dismissed early in their tenure or because the board opts for non-duality as a permanent leadership structure. Understanding what affects the duration of CEO probation period is theoretically and practically important because a prolonged period of uncertainty about the CEO's future with the firm can have material implications for both the CEO's career and the firm's performance (Ballinger & Marcel, 2010).

This essay proposes that boards prolong CEO probation periods to the extent that they perceive a high likelihood of the CEO voluntarily exiting the firm. I draw on research in human capital and employee mobility to argue that when a board perceives its new CEO as more likely to leave their position at the firm—generally for a better career prospect at another firm—the board will withhold the chair title from the CEO for longer in order to mitigate the turmoil and cost associated with frequent CEO succession (Kim et al., 2020; Schepker et al., 2017). A separate board chair is more informed than a typical outside director, and frequently the separate

chair following a succession is the former CEO (Krause & Semadeni, 2013; Quigley & Hambrick, 2012). Whether independent or not, the separate board chair can maintain continuity of leadership if the CEO leaves, potentially even acting as an interim CEO while the board searches for a replacement (Ballinger & Marcel, 2010; Mooney et al., 2017).

To test the theory, a natural experiment is employed. Over several years, U.S. state courts issued precedent-setting rejections of Inevitable Disclosure Doctrine (IDD), which exogenously increased employment opportunities within the courts' jurisdictions (Na, 2020). IDD is a trade secret protection legal doctrine providing employers with a mechanism to prevent an employee from working for competitors if they would inevitably disclose trade secrets of the focal firm. State court decisions rejecting IDD increase employee mobility because the potential for sharing trade secrets ceases to be a legal impediment to their moving between firms (Contigiani et al., 2018; Flammer & Kacperczyk, 2019). Following Na's (2020) use of IDD to capture CEO employment mobility, I find that state-level IDD rejection increases the time boards wait before awarding new CEOs with the additional title of board chair. Consistent with this theory, relationship weakens with industry- and firm-level factors that decrease the CEO's likelihood of leaving for a competitor (Chen et al., 2021).

Executive mobility is a complex phenomenon that can materially impact the fortunes of organizations, and a robust academic literature has evolved to understand this phenomenon (e.g., Bermiss & Murmann, 2015; Vaid et al., 2021). Scholars have identified the early years of a CEO's tenure as among the most precarious in the lives of both the CEO and the organization. This research contributes to the broader understanding of the CEO probationary period by directly examining and explaining why some boards shorten or extend this probationary period. By showing that CEO probation responds to exogenous changes in CEO mobility, this essay

contributes to existing theory on the board's role in CEO careers. This study provides evidence that CEO probation may be driven by the board protecting itself as much against *voluntary* CEO exit as against CEO incompetence or malfeasance. This insight has the potential to change the way scholars view the dynamic between the board and new CEO, adding new tools of influence—the CEO's ability to leave and the board's ability to withhold authority—to the balance of power.

Theory and Hypotheses

CEO Turnover and New CEO Probation

CEO turnover is among the most disruptive events in the life of an organization. Upper echelons research has generated strong theory and evidence that strategic leaders have a significant impact on their organizations, and that changing the top leader of the organization has the potential to bring significant upheaval (e.g., Chen & Hambrick, 2012; Finkelstein & Hambrick, 1990; Westphal & Fredrickson, 2001). Whether as a result of a CEO dismissal, retirement, or resignation, CEO turnover involves a change in the individual responsible for top-level organizational decision-making, and thus an increase in organizational uncertainty (Berns & Klarner, 2017; Schepker et al., 2017).

To manage this uncertainty, boards of directors often impose a probation period on new CEOs, withholding some authority and responsibility from them in the early days of their tenure (Brickley et al., 1997; Vancil, 1987). This probation period serves a few different functions. On one level, it can potentially increase the likelihood of the new CEO's success by temporarily limiting the burdens on the CEO's time. Upper echelons theorists have argued that early in a CEO's tenure, the firm is likely to benefit from a more supportive governance approach, where the board focuses more on leadership development than on entrenchment avoidance (Shen,

2003). Limiting the CEO's responsibilities can allow the CEO time to learn the organization. On another level, however, the probation period is also a risk management strategy for the board. Given the uncertainty associated with a new CEO, boards can protect the organization from some disruption, both during the initial months of a CEO's tenure as well as in the event of a quick successive turnover, by spreading the organization's top leadership responsibilities across more than just one individual. Finally, a probation period allows the board to better understand the individual they have put in charge of the organization, potentially leading to changes in the CEO's compensation or even employment (Graffin et al., 2013; Zhang, 2008).

The form of new CEO probation can differ—such as with the use of interim CEO successions (Chen et al., 2015; Mooney et al., 2017)—but the most common form in the U.S. is the withholding of the board chair title from the new CEO for a period of time (Krause & Semadeni, 2013; Quigley & Hambrick, 2012). In each year of the last decade, only about 10 percent of new S&P 500 CEOs were also named board chair upon appointment, whereas about half of S&P 500 CEOs overall are also board chair at any point in time (Spencer Stuart, 2021). Vancil (1987) discussed this kind of CEO probation as part of a larger relay succession mechanism, whereby the outgoing CEO remains as board chair while the new CEO gets acquainted with the position. This time period when the former CEO remains as board chair creates an opportunity for closer scrutiny of the new CEO and a test of his or her abilities (Quigley & Hambrick, 2012). As Brickley et al. (1997: 194) explain, "If the new CEO passes this test, then typically the new CEO earns the additional title of chairman, and the old chairman resigns from the board." The authors note, however, that the same probation approach is used when the former CEO does not remain as chair, but rather an independent director fills that role. This typically happens when the outgoing CEO is dismissed. In either case, withholding the

board chair title can empower boards to incentivize performance from their new CEOs as well as manage the fallout if the new CEO leaves soon after taking the position (Kim et al., 2020).

Though it is widely understood that boards use a probationary period in many instances, and that withholding the chair title is a common method for doing so, there remains sparse theoretical explanation for why firms vary in their new CEO probation period. Some boards award the title of board chair to new CEOs immediately, some after a year or two, and some never do before the new CEO leaves the organization. Previous research has suggested that boards mainly base the decision to end probation and combine the CEO and board chair title in response to strong firm performance under the new CEO's leadership (e.g., Brickley et al., 1997; Krause & Semadeni, 2013). However, in many circumstances, firm performance in the first year of a new CEO's tenure is likely still to bear the imprint of the strategic decisions made by the CEO's predecessor (Quigley & Hambrick, 2012). Moreover, strong initial performance cannot explain the shortest probation periods, and certainly not the choice to forgo probation altogether and award the CEO and chair titles together right away. Thus, while strong firm performance may accelerate CEO-board chair combination in some circumstances, it lacks strong theoretical grounding to explain the duration of new CEO probation overall.

This essay draws on theory of human capital mobility to argue that CEO probation time primarily reflects a board's management of the risk of a new CEO leaving soon after taking the job. Research has shown that frequent CEO turnover is very costly to organizations, and boards have strong incentives to protect themselves if they perceive a high risk of voluntary CEO exit. The next section introduces the concept of CEO mobility and develops theoretical arguments.

Human Capital Mobility and New CEO Probation

Human capital mobility—the ease with which employees can move from one employer to another—is a mainstay of competitive market economies, with significant implications for organizations on either side of an employee's move (Mawdsley & Somaya, 2016). Considerable research has focused on examining these implications, focusing on outcomes such as knowledge spillover to the destination firm (Agarwal et al., 2009), or weakened competitive advantage for the source firm (Campbell et al., 2012). Though most of the research on human capital mobility has focused on employees in general or in specific groups, scholars have also demonstrated that top executives and other key employees move frequently among employers, and that the extent of their mobility affects the firms involved (Aime et al., 2010; Gao et al., 2018).

For top executives and for CEOs in particular, human capital mobility has increased in recent years. In contrast to the relatively routine world of relay CEO succession that Vancil (1987) described, it has become relatively common for firms to hire outside CEOs, and for firms to poach CEOs from other firms, even competitors (Karaevli, 2007). As such, boards have sought ways to retain CEOs in the face of increasing CEO mobility. Na (2020) recently showed that exogenous increases in CEOs' outside employment opportunities increased the sensitivity of CEO compensation to the systematic performance of the peer firms in the industry rather than the unsystematic performance of the CEO's home firm. Tying the CEO's compensation to the overall industry's performance reduces the incentive for the CEO to leave the firm, even if it also reduces the incentive to promote shareholder value beyond an industry benchmark.

Some corporate governance scholars have suggested that the board chair title can serve as another form of incentive to attract or retain a CEO in the face of a competitive executive labor market (Brickley et al., 1997; Dalton & Dalton, 2009). This view would suggest that as human

capital mobility increases, boards might be inclined to shorten or forego CEO probation and bring new CEOs in as board chair right away. However, such a possibility introduces an accompanying problem for the board. If CEO mobility is high, a chair title might help retain the CEO but in the event the CEO leaves, the firm will endure much greater disruption as a result of the CEO's departure (Harris & Helfat, 1998). Whereas occasional CEO succession can be adaptive (Schepker et al., 2017), multiple, successive CEO turnover events are detrimental to the firm (Kim et al., 2020). If the new CEO is also chair of the board, then when that CEO leaves, the board must replace two leadership positions rather than one, and simultaneously lacks a ready interim replacement. If human capital mobility is greater, this downside potential increases with CEO duality.

In contrast, withholding the board chair title, with either the former CEO or an independent director serving as chair, buffers the firm from some of the disruptive impact of a quick CEO succession. Even when independent, a non-CEO chair possesses greater firm-specific knowledge than the rest of the board by virtue of more frequent communication with the CEO. Should a new CEO depart soon after taking office, the board chair is a ready candidate to serve as interim CEO until a replacement is found, smoothing the transition. In their study of interim CEO appointments, Ballinger and Marcel (2010) argued that "the chairman of the board is the likeliest candidate to fill the interim CEO position," because board chairs possess the authority and the knowledge to manage the inevitable disruption and potential political upheaval among the remaining executives, several of whom might seek the CEO job. In support of this argument, the authors found that board chairs who step in as interim CEO mitigate the negative performance consequences of interim CEO succession. Given the heightened risk of CEO

turnover early in a CEO's tenure, boards are likely to hold back the board chair title from the CEO until they are more confident the CEO will stay in the job.

Therefore, this study predicts that when human capital mobility increases, such that CEOs face greater opportunities to change organizations, boards will impose longer probation periods on their CEOs in the form of withholding the board chair title for longer. If human capital mobility is low, boards may be more inclined to appoint one individual to both positions simultaneously or within the first year. If human capital mobility is high, boards are likely to wait two or three years before risking the disruption of losing a relatively new CEO and chair in a single event, if they take the risk at all.

Hypothesis 1. *Human capital mobility is positively associated with new CEO probation.*

Firm Performance and CEO Marketability

The key mechanism underlying the prediction that human capital mobility is associated with new CEO probation is the risk of the new CEO quickly leaving the organization for another position, leaving the focal firm with a leadership vacuum. For this assumption to hold, it should also be true that the more marketable the CEO is in the executive labor market, the stronger the effect of human capital mobility (Na, 2020). If a CEO is highly marketable, an environment of high human capital mobility presents the board with a significant risk of CEO departure; if the CEO is not very marketable individually, the mobility of human capital in the broader labor market is less likely to weigh on the board's decision-making, as the CEO is in a less advantageous position to take advantage of it. CEO marketability refers not just to the number of outside opportunities, which is driven by human capital mobility overall, but to the ability of the CEO to procure more attractive opportunities in terms of prestige, compensation, and other desirable employment attributes.

Though many factors can affect a CEO's marketability, I build on prior research by focusing on the signaling impact of firm performance (Khan et al., 2018; Na, 2020). Boards are unlikely to evaluate their own new CEOs based on financial performance because "early in a CEO's tenure, organizational performance and even the potential range of strategic choices are strongly influenced by decisions of the prior CEO" (Graffin et al., 2013: 385). In contrast, outside firms (i.e., potential employers) have neither the information gleaned from the vetting process nor the early internal decisions of the new CEO available to judge the individual as a possible candidate. Rather, the performance of the firm, itself, acts as a signal of the new CEO's quality. A high-performing firm appointing a new CEO confers a form of certification on the new leader (Wade et al., 2006), whereas being appointed as the CEO of a low-performing firm substantially dampens a new CEO's short-term employment prospects (Chang et al., 2016; Chen, 2015). In the long-run, successfully turning around a struggling firm can bolster a CEO's reputation and even make them a celebrity (Hayward et al., 2004), but in the first few years of a new CEO's tenure, poor firm performance decreases the CEO's marketability.

The contingency factor of firm performance helps to establish the theoretical mechanism not only by capturing CEO marketability but also by helping to rule out alternative explanations. It could be argued that human capital mobility extends new CEO probation not because the board is hedging its CEO departure risk but because human capital mobility creates more strategic challenges for the new CEO and the board needs longer to evaluate the executive (Aime et al., 2010; Campbell et al., 2012). This explanation would be consistent with the extant theoretical view of CEO probation as simply a period in which the board uses firm performance to determine whether to keep the new CEO (Brickley et al., 1997; Vancil, 1987). If this alternative explanation were true, one would expect strong firm performance to *weaken* the effect

of human capital mobility on new CEO probation, as the board would determine the CEO is capable of managing the competitive environment. I, however, expect the opposite. Because early firm performance generally reflects path-dependent decisions of the prior CEO, it is more likely to certify the CEO in the eyes of external observers than inform the appointing board's evaluations (Graffin et al., 2013).

The greater the performance of the firm, the more marketable the new CEO is to the broader executive labor market. A more marketable CEO is more likely to take advantage of an executive labor market with high human capital mobility than is a less marketable CEO. Therefore, I expect that firm performance during a new CEO's tenure strengthens the positive effect of human capital mobility on the new CEO's probation time.

Hypothesis 2. *Firm performance during a new CEO's tenure strengthens the positive effect of human capital mobility on new CEO probation.*

Industry Concentration and Related Opportunities

A CEO's ability to take advantage of human capital mobility depends not only on the CEO's own marketability, but also on the relevance of possible market opportunities. Though firms will often appoint CEOs from outside their industries, within-industry experience is generally viewed as a positive factor in choosing a CEO (Karaevli, 2007; Zhang & Rajagopalan, 2003). CEOs have more plausible employment opportunities at firms in the same industry than at firms in other industries (Na, 2020). Similarly, the more firms there are of roughly the same size within the industry, the more plausible opportunities there are for a CEO to move. Firms of similar size in the same industry are likely to compete over resources, markets, and talent (Mas-Ruiz & Ruiz-Moreno, 2011).

Therefore, I expect that industry concentration will weaken the positive effect of human capital mobility on new CEO probation. Highly concentrated industries are less competitive; the presence of a few dominant players generally reflects oligopolistic market power, with less direct competition among firms. Employees in environments characterized by high human capital mobility may be able to move jobs easily, but the availability of jobs will be lower the more concentrated the industry is. Similarly, boards will view a new CEO as less of a flight risk if the industry is highly concentrated, even if human capital mobility is high. Thus, it is likely that human capital mobility will not prolong new CEO probation as much in highly concentrated industries.

Hypothesis 3. *Industry concentration weakens the positive effect of human capital mobility on new CEO probation.*

Data and Methodology

Study Context

A natural experiment is used to test the hypotheses. Specifically, I capture the exogenous increase in human capital mobility through the staggered rejection of the IDD among different states in the U.S. IDD is a legal measure that prevents an employee from working for a competitor firm if the employee would *inevitably* disclose trade secrets. The threat of irreversible financial injury without actual damage is enough for the employer to initiate action under IDD, making IDD a stronger method of limiting human capital mobility than non-disclosure agreements (NDA) or covenant not-to-compete (CNC) clauses (Klasa, Ortiz-Molina, Serfling, & Srinivasan, 2018). Moreover, IDD offers protection for the firm even if the employee moves to a competitor in a different state where IDD is not applicable. Thus, IDD provides significant benefits to employers at the expense of employee mobility.

IDD law is adopted at the state level in the United States. The earliest adoption was by New York in 1919. However, recently many states have rejected IDD at different times, as Table 1 shows. The staggered, state-by-state rejection of IDD has served as a natural experiment for several scholars to capture an exogenous variation in human capital mobility (Chen et al., 2021; Contigiani et al., 2018; Flammer & Kacperczyk, 2019). CEO mobility is particularly impacted by IDD rejection, because CEOs know a firm's important trade secrets. Recently, Na (2020) used IDD rejection specifically to capture CEOs' outside employment opportunities. This essay follows the same approach to capture variation in employee mobility. I use survival modeling to estimate the effect of CEO mobility on new CEO probation.

<Insert Table 1 here>

Data and Variable Definitions

Data sources and sample selection

To construct the sample, I merge the databases of Institutional Shareholder Services (ISS), COMPUSTAT, and ExecuComp. Compustat contains accounting and firm-level financial information. ExecuComp contains data on the compensation of the top five[17] highest-paid executives of companies in the S&P 1500 index. I obtain TMT level information from here. The ISS Directors database contains data on S&P 1500 firms' boards of directors, including director age, tenure, gender, shares owned, and titles, which can be used to determine CEO duality. The ISS Directors database begins with 2007. Therefore, on merging the three databases, I obtain a sample of S&P 1500 firms from 2007 to 2019.

I merge these data with headquarters state data from COMPUSTAT and drop observations with missing headquarters information. Using headquarters state, I further merge

[17] ExecuComp collects up to nine executive's data depending upon the disclosures in the proxy statements though most companies report only five executive's data.

this data with the IDD rejection data from Table 1, which provides data on U.S. states, state codes, and corresponding IDD rejection dates. I drop observations for executives who became CEO before 2007 as I don't have board-level data from the onset of risk, i.e., from the year the executive becomes the CEO. Finally, after excluding observations with missing information, I obtain a sample of 5,896 firm-year observations from 2008-2019.

Dependent variables

For survival analysis, one needs to define risk, the onset of risk, the failure event, and the time variable. In this essay, risk is the hazard of the CEO becoming the board chair. The onset of risk starts when an executive becomes the CEO of a firm. To indicate the onset of the risk, I create a C*EO appointment year* variable, which indicates the year the executive is appointed as the CEO. The failure event occurs when the CEO becomes the board chair. This may occur in the year of appointment, or in any subsequent year of the CEO's tenure. The CEO exits the risk set at either the time of failure (i.e., CEO-board chair combination) or the time of exit from the firm, whichever occurs earlier. I use competing survival analysis to account for CEO exiting the firm without becoming board-chair.

Independent variable

I use state-level IDD rejection to measure the independent variable, *human capital mobility*. In the data, a total of 16 states had rejected IDD by 2016[18]. *Human capital mobility* is an indicator variable equal to one for firms headquartered in states where IDD is no longer enforced and 0 otherwise. When this variable takes a value of 1, this implies CEOs working for firms headquartered in those states have higher human capital mobility (Na, 2020).

Moderators

[18] We run the analysis on a subsample of firms from 2008-2016 and obtain similar results.

I examine two moderators, *firm performance* and *industry concentration*. *Industry concentration* is measured with a Herfindahl-Hirschman Index (HHI) of market shares, a commonly accepted measure of industry concentration or (reverse-coded) industry competition. It is calculated as the sum of squares of market shares of each firm operating in an industry in a year. Its value can range from 0 to 1. A value of 0 indicates that the industry is operating at perfect competition. A value of 1 would suggest that there is only one firm in the market (i.e., monopoly). Revenue from COMPUSTAT is used to calculate market shares and 2-digit SIC is used for industry classification. Return on assets (ROA), calculated as the ratio of net income to total assets, is used as a measure of firm performance.

Control variables

I control for firm-, executive-, and board-level characteristics in the analysis. I capture *Firm size* using the natural logarithm of the total number of employees in thousands. *Firm leverage* is the ratio of total debt—long-term and current—to the book value of total assets. *CEO age* is the age of the CEO obtained from ExecuComp. *CEO external* is coded as 1 if the CEO is appointed within two years of being on the TMT, coded 0 otherwise (Cummings and Knott, 2018). An executive's time on the TMT is obtained from ExecuComp database. It is calculated from the year the executive first appears on the TMT of a given firm to the year the executive becomes the CEO. *CEO stock ownership* is the ratio of stock owned by the CEO to common shares outstanding. Stock owned is obtained from ISS and shares outstanding from COMPUSTAT. *TMT size* is the total number of executives listed in ExecuComp in a given year.

The ISS Directors database is used to measure the following board-level variables. *Board size* is the total number of directors on the board of a firm in a year. *Board female representation* is the percentage of female directors on a board. *Average board tenure* is the average number of

years the board members have served on the board of the focal firm. *Board stock ownership* is the ratio of total stock owned by all directors (except CEO) on the board to common shares outstanding. *Board independence* is calculated as the lagged[19] percentage of independent directors on a board in a year.

I also control for time-invariant industry effects using industry dummies (Sharp et al., 2013), time effects using the CEO joining year dummies (Certo & Semadeni, 2006), and state fixed effects using state dummies. To account for the panel structure of the data, I cluster standard errors at the firm level.[20] Summary of variable definitions and data sources is presented in Table 2.

<Insert Table 2 here>

Summary statistics

For the main variables in the data, I present summary statistics and the correlation matrix in Table 3. Mean (std. deviation) CEO probation is 3.07 (2.21) years. In the sample, on average, 25 percent of firm-year observations have CEO duality[21]. IDD rejection has a mean (std. deviation) of 0.58 (0.49). This indicates that, on average, 58 percent of the sample is in the IDD rejection group.

<Insert Table 3 >

Methodology: Survival Analysis

I am interested in understanding the effect of increased mobility of CEOs on CEO probation (i.e., the time between the CEO's appointment as CEO and the subsequent appointment as board chair). The normality assumption is unreasonable (Cleves, Gould, Gould, Gutierrez, &

[19] When the CEO becomes the board chair, board independence is directly affected as a new director is appointed to the board. Board independence is lagged to avoid this apparent reverse causal effect.
[20] Clustering standard errors at the state level also produce similar results.
[21] This is to be interpreted at sample level. This is different from the duality percentage at CEO or firm level.

Marchenko, 2008) in this case, therefore we don't employ an ordinary least squares regression. Therefore, I use survival analysis for estimation. I defined CEO becoming the board chair as the risk in survival models, but a CEO may leave the organization even before becoming a board chair. I need to account for this possibility in the models. In other words, CEO becoming board chair and CEO exiting the firm are competing risks: only one of them can happen first. Therefore, I use competing risks survival models. I have a panel data of 5,896 firm-year observations from 2008-2019. Since I have panel structure, for a given firm and CEO under risk, the value of the covariates potentially changes during the analysis time without remaining constant at their initial values.

Parametric and non-parametric models have been developed to analyze survival data. Accelerated failure time (AFT) models are parametric models that make assumptions about the underlying survival and hazard function. Cox proportional hazard models (Cox 1972) are semi-parametric models that don't make any assumptions about the survival function. Since I am interested in survival duration, AFT models provide the advantage that the estimated coefficients can be understood as changing the survival time or duration. Also, AFT models are more efficient compared to Cox models (Cleves et al., 2008). I present AFT results going forward in the essay but I estimate Cox proportional hazard models too for robustness and obtain similar results. In AFT models, the logarithm of survival time (t) is defined as a linear function of covariates (x).

$$\ln(t) = x\beta + \epsilon = x\beta + \ln(t_0)$$

In a Cox proportional hazard model, covariates enter multiplicatively on the baseline hazard whereas in an AFT model covariates enter multiplicatively on the time.

$$t = e^{x\beta} t_0$$

The underlying survival function is given as shown below. S_0 is the base line survivor function where all covariates are zero.

$$S(t,x) = S_0\{\exp(-x\beta)t)\}$$

Depending on the distribution of t_0, different models are obtained. t_0 commonly takes weibull, exponential, log-normal or log-logistic distributions. The hazard function of the log-normal distribution is non-monotonic; it increases with time to reach a maximum and then decreases. Most CEOs become board chair within three years of their appointment as CEO, if they become board chair at all. This shows that the hazard of becoming the board chair is very high in the first couple of years and drops down afterwards pointing to a log-normal[22] distribution. With t_0 following a log-normal distribution with mean β_0 and variance σ, the underlying survival function is given as shown below. The model estimates β_0 and β, the effect of covariates on survival time and σ, the scale parameter estimated from the data.

$$S(t,x) = 1 - \Phi\left\{\frac{\ln(t) - (\beta_0 + x\beta)}{\sigma}\right\}$$

A positive coefficient of β implies the corresponding covariate increases expected CEO probation (i.e., decreases the hazard of CEO-chair combination) and a negative coefficient indicates the covariate decreases the expected CEO probation (i.e., increases the hazard of CEO-chair combination). Time ratio, also called acceleration factor helps interpret the coefficient better. Time ratio of a covariate is calculated as the natural exponent of the corresponding coefficient β. If time factor is greater (less) than 1, it implies the covariate increases (decreases) the survival time period.

Though outcome of interest is CEO becoming the board chair, I need to account for CEOs who exit the firm without becoming board chair. Competing risks survival model accounts

[22] For robustness we run the model with log-log assumption and obtain similar results.

for multiple exits and models the time to an event. A competing risk is an event whose incidence prevents the occurrence of event of interest. For example, if the event of interest is death due to cardiovascular diseases, death from other causes prevents the event of interest from occurring. There are two events in the model, CEO becoming the board chair (event of interest) and CEO leaving the firm without becoming board chair (competing risk). If the CEO exits the firm without becoming the board chair, it precludes the event of interest from happening. Similarly, if the CEO becomes the board chair, it prevents the occurrence of competing risk. Since there are two events, there are two failure times: T1, time to CEO board chair appointment and T2, time to CEO exit before board chair appointment. The objective is to model the time to event of interest (T1) while accounting for the correlation between the two failure times. The correlation cannot be obtained from the data as I observe either T1 or T2 for a CEO depending on which event occurs first. However, I can estimate failure time and the hazard of a CEO becoming board chair by treating CEOs who exited the firm without becoming board chair as right-censored at the point of exit from the firm (Cox & Oakes, 1984)[23]. I report estimated coefficients as well as marginal effects based on a discrete change in dummy variables and a standard deviation increase in continuous variables.

Results

Survival Analysis Results

Table 4 and 5 show the results from survival analysis. Table 4 shows the results of the main model. Model 1 is the baseline model that includes only control variables. Model 2 shows the main effects of focal variables. I add human capital mobility, industry concentration and firm

[23] Even if the risks are correlated we can estimate the coefficients of covariates on failure time. Right-censoring is a computational device to estimate the model and doesn't assume independence of T1 and T2.

performance to the control variables in Model 1. Table 5 shows the results of the full model with moderators. Model 3 shows the full model with interaction terms included.

Results presented in Table 4 provide evidence that as human capital mobility increases, CEO probation increases. Model 2 with the main effects shows a positive impact of an exogenous rejection of IDD at the state level ($\beta = 0.39$, $p = .03$). The accelerating factor for IDD rejection is 1.48 ($e^{0.39}$) indicating a longer survival time period. It implies that after IDD is rejected probation time period increases. Marginal effects show that probation time period increases by nearly fifty percent. This positive effect continues to hold in Model 3 ($\beta = 0.47$, $p = .01$) indicating a sixty percent increase in time to board chair appointment. These results provide strong support for Hypothesis 1.

Results in Table 5 provide support for the moderating hypotheses as well. The interaction of human capital mobility and firm performance has a positive coefficient ($\beta = 1.38$ $p = .03$). This indicates that as firm performance increases the positive effect of IDD rejection on probation period strengthens, supporting Hypothesis 2. After IDD rejection, predicted mean time to board chair appointment increases by 40, 60, and 85 percent at one standard deviation below mean, at the mean value, and one standard deviation above mean of ROA, respectively. The interaction of human capital mobility and industry concentration has a negative coefficient ($\beta = -1.18$, $p = .00$). This indicates that as industry concentration increases the positive effect of IDD rejection on probation period weakens, supporting Hypothesis 3. After IDD rejection, predicted mean time to board chair appointment increases by 105, 60, and 25 percent at one standard deviation below mean, at the mean value, and one standard deviation above mean of ROA, respectively.

<Insert Tables 4 and 5 here>

Figure 1 presents hazard function graph. CEOs face less hazard after IDD rejection throughout the analysis period. This indicates longer time to board chair after IDD rejection supporting Hypothesis 1. The hazard is lower in the initial years and increases with time, eventually decreasing again. To further visualize the overall effect of human capital mobility on CEO probation, I charted the percentage of CEOs appointed as board chairs over time in the CEO position, separated by IDD rejection context. As Figure 2 shows, most CEOs who ultimately become board chairs do so within the first three years of tenure, but the proportion is lower for CEOs in states where IDD has been rejected. Over time, the difference in the proportion of CEOs becoming board chair decreases and even reverses, suggesting boards generally take longer to end probation in states where IDD has been rejected.

<Insert Figures 1-2 here>

Robustness Analysis at Monthly Level

I conducted survival analysis at the yearly level since many of the variables (moderators and controls) are measured annually. However, analyzing the data at yearly level may obscure important differences in in the probation time. Therefore, I perform monthly[24] survival analysis to examine the robustness of results.

Collecting CEO appointment and chair appointment dates for all the CEOs in the data is a cumbersome process. Therefore, I run the analysis on a subsample. In main sample, there are firms in states where IDD is not rejected, firms in states where IDD is rejected but before the sample period starts, and firms where IDD is varying in my time period. I run the analysis on a sample of firms where IDD is varying in the data. There are 86 such firms and 149 CEOs. After dropping CEOs with missing dates and CEOs who became board chairs first and CEOs later, we

[24] Data at day level is not available for many CEOs and sometimes the days are conflicting between sources, hence we choose monthly data.

have 83 firms and 138 CEOs. Of these, 45 CEOs became board chairs and 93 CEOs did not. Of the CEOs who eventually became chair, the mean probation period is 52.5 months for CEOs in IDD rejection states and 22.5 months for CEOs in IDD non-rejection states. Thus, there is a 30 month increase in probation time with IDD rejection relative to non-rejection. For the 45 CEOs who became chairs, Figure 3 plots probation period against count of CEOs who became chairs for IDD rejected and non-rejected cases. It is visible that after IDD rejection CEOs become chair later in their tenure.

<Insert Figure 3 here>

Table 6 shows the results from monthly survival analysis. Model 4 shows analysis with focal variables only. Model 5 shows main effects of focal variables and control variables. Model 6 shows the full model with moderating effects. I observe that results from monthly survival analysis are similar to main analysis at a yearly level. Model 4 ($\beta = 0.80$, $p = .00$) and Model 5 ($\beta = 0.49$, $p = .10$) show that the main effect of human capital mobility on probation time is positive. Model 6 shows the support for the hypothesized moderating effects of firm performance ($\beta = 17.14$, $p = .00$) and industry concentration ($\beta = -1.96$, $p = .07$).

Discussion

This study examines the effect of human capital mobility on new CEO probation. I proposed that after IDD rejection boards increase the time taken to offer board chair position to the CEO to protect the firm against the cost of CEO-board chair turnover. As hypothesized, results provide empirical support that IDD rejection increases CEO probation period. I also find that industry concentration weakens and firm performance strengthens the effect consistent with the proposed theory. Thus, this essay provides theoretical and empirical contributions to the area of CEO probation period.

CEO probation and survival analysis

Previous research has largely focused on predicting the success of CEO probation period i.e. the consolidation of CEO and board chair position. CEO probation period, the time to board chair of a CEO, however, is not well researched. This essay is one of the first studies to show that time to board chair can be a strategic tool in balancing the power between board and CEO. Krause and Semadeni (2013) call for a nuanced approach to CEO-board chair combination emphasizing not just on whether to separate or not. They show that the context-specific factor of performance and the type of separation, the when and how, are important for CEO board chair separation to be effective. This essay answers this call by focusing on the contextual factor of time and studying time to board chair of a CEO. This study encourages researchers to further examine the factors affecting CEO probation period and the contextual factors and phenomena such as trade secrets.

Survival analysis presents a perfect method to examine time to an event i.e., time to board chair. Previous studies used panel models, logit models, and meta-analysis (Dalton, Daily, Ellstrand, & Johnson, 1998) to examine the successes of CEO probation period owing to the nature of the variable of interest – continuous measures of firm performance and agency variables or duality vs. no-duality. In this study, I use survival analysis to understand CEO probation period that I hope will be employed by other researchers.

Employing CEO succession to examine CEO probation period.

Agency theory and stewardship theory are the two predominant theories in CEO-board chair literature. CEO succession is an alternate perspective first presented by Harris and Helfat (1998) to understand duality. In their context, they argue that CEO succession arguments make more sense than an agency perspective. Similarly while one can try to explain the phenomenon

using agency perspective, it is a very weak explanation. After IDD rejection, CEO's external opportunities increase and cost of potential dismissal are low. This can empower the CEO to take greater risks and engage in self-serving activities. Combining the two positions early and bestowing CEO with greater power would be harmful to the firm and boards might want to extend the time to board chair. However, after IDD rejection lower cost of dismissal alone without any change in CEO's power or status-quo exacerbating agency issues is unlikely. While the two theories have similar predictions, agency theory is an improbable explanation that should not be applied to all phenomenon. This study examines the effect of human capital mobility on CEO probation through the new lens of CEO succession. This essay shows that boards extend time to board chair to mitigate the risk of CEO-chair turnover and protect the firm against the cost of CEO and board chair succession.

New context to explore CEO probation

I study the effect of external opportunities on CEO probation. Literature largely focused on the primarily concentrated on its impact on firm performance or agency issues. In this study, I look at the rejection of trade secret law, IDD by U.S. states. When IDD is rejected, employee's external opportunities increase, and trade secret protection is weakened. Boards can use duality to retain CEO and protect trade secrets or extend the time to board chair and protect the firm against the increased risk of CEO-chair turnover. I find that boards incline towards the latter choice. While retaining CEOs and protecting trade secrets is important, there are other pecuniary and non-financial ways to retain CEOs without exposing the firm to greater risk by combining the two positions early. While this essay explores the time to board chair of the CEO, future research can study the effect of IDD on the likelihood of combination or separation of the two positions.

Limitations

Naturally, this study has limitations as with any empirical research. First, since I am interested in board-level phenomenon, I had to use the ISS database resulting in a smaller sample starting from 2007, while other studies had the luxury of using larger samples starting from 1980. Second, while the effect of an increase in employment opportunities for the CEO on time to board chair is examined, the firm performance implications of such an action is not estimated. Future research can develop and test this effect.

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TABLE 1 Year of IDD rejection by state

State Code	State	Year
VA	Virginia	1999
FL	Florida	2001
CA	California	2002
MI	Michigan	2002
TX	Texas	2003
MD	Maryland	2004
OH	Ohio	2008
AR	Arkansas	2009
NY	New York	2009
WI	Wisconsin	2009
NH	New Hampshire	2010
MA	Massachusetts	2012
NJ	New Jersey	2012
WA	Washington	2012
GA	Georgia	2013
NC	North Carolina	2014

TABLE 2 Summary of variables, measures and data sources

Conceptual Variable	*Measured Variable*	*Data Source*
Independent Variable		
IDD Rejection	An indicator variable equal to one for firms headquartered in states where IDD is rejected and 0 otherwise.	Na (2020)
Moderators		
HHI	Sum of squares of market shares of firms in an industry in a given year. 2-digit SIC is used for industry classification.	COMPUSTAT
ROA	Ratio of net income to total assets (ni/at)	COMPUSTAT
Control Variables		
Firm size	Natural logarithm of total number of employees (log(1+emp))	COMPUSTAT
Firm leverage	Ratio of debt (long term debt and debt in current liabilities) to total assets (dltt+dlc/at)	COMPUSTAT
CEO age	Age of the CEO	ExecuComp
CEO external	Coded as 1 if an executive becomes the CEO within 2 years of being on the TMT. Coded 0 otherwise.	ExecuComp
CEO stock ownership	Ratio of stock owned by CEO to common shares outstanding	ISS and COMPUSTAT
TMT size	Number of executives on the TMT in a given year	ExecuComp
Board size	Natural logarithm of total number of directors on the board	ISS
Board gender	Percentage of female directors on a board	ISS
Average board tenure	Average of tenure of all board members in a year	ISS
Board stock ownership	Ratio of stocks owned by all directors on the board to common shares outstanding	ISS and COMPUSTAT
Board Independence	Percentage of independent directors on a board	ISS

TABLE 3 Summary statistics and correlations

Variables	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) IDD rejection	.58	0.49	1.00															
(2) HHI	.25	0.21	-0.04	1.00														
(3) board independence	80.86	10.07	-0.08	-0.14	1.00													
(4) CEO stock ownership	.01	0.02	-0.04	0.07	-0.17	1.00												
(5) Firm size	1.96	1.66	0.05	0.18	0.11	-0.08	1.00											
(6) ROA	.04	0.10	0.01	0.03	-0.01	0.02	0.15	1.00										
(7) Leverage	.26	0.21	0.02	-0.07	0.08	-0.06	0.11	-0.12	1.00									
(8) CEO age	55.36	6.14	0.03	-0.04	0.08	0.08	0.09	-0.03	0.01	1.00								
(9) CEO external	.34	0.47	0.03	-0.02	0.09	-0.05	-0.15	-0.09	-0.06	-0.02	1.00							
(10) TMT size	5.62	1.08	-0.01	0.05	0.03	-0.07	0.07	-0.07	0.02	0.04	0.08	1.00						
(11) Board size	9.76	2.22	0.01	0.00	0.18	-0.21	0.43	0.06	0.07	0.09	-0.15	0.09	1.00					
(12) Board gender	17.86	10.83	0.01	-0.04	0.24	-0.03	0.26	0.10	0.10	0.11	-0.07	0.01	0.21	1.00				
(13) Avg board tenure	8.52	3.30	0.03	0.00	-0.35	0.18	-0.05	0.08	-0.06	0.12	-0.18	-0.10	-0.02	-0.13	1.00			
(14) Board stock ownership	.04	0.09	0.03	0.18	-0.35	0.16	-0.02	-0.02	0.01	-0.06	0.00	-0.04	-0.03	-0.11	0.21	1.00		
(15) CEO duality	0.25	0.43	-0.06	-0.02	0.21	0.18	0.17	0.04	-0.03	0.20	-0.14	0.00	0.10	0.10	0.00	-0.18	1.00	
(16) Time to board chair	3.07	2.21	0.03	-0.11	0.06	0.03	-0.02	0.05	0.04	0.17	0.02	-0.20	-0.01	0.09	0.15	-0.02	-0.13	1.00

Note: n=5896 for all variables except time to board chair. n = 4464 for time to board chair. It is created by the survival model where it drops observations that begin on or after first failure. All correlations greater than .026 are significant.

TABLE 4 AFT Survival Models of CEO Probation -Main Effects

	Model 1	Model 2	Model 2
Variables	**Controls only**	**Main effects only**	**Marginal Effects (%)**
IDD rejection		0.39	47.87
		(0.03)	
HHI		-1.70	-35.58
		(0.00)	
ROA		0.22	2.26
		(0.50)	
Firm size	-0.21	-0.20	-33.04
	(0.00)	(0.00)	
Firm leverage	0.84	0.82	16.75
	(0.00)	(0.00)	
CEO age	-0.03	-0.03	-15.42
	(0.00)	(0.00)	
CEO external	0.21	0.20	9.31
	(0.04)	(0.04)	
CEO stock ownership	-15.21	-14.40	-34.20
	(0.00)	(0.00)	
TMT size	-0.17	-0.16	-17.68
	(0.00)	(0.00)	
Board size	0.05	0.05	10.79
	(0.04)	(0.02)	
Board female representation	-0.00	-0.00	-2.61
	(0.76)	(0.58)	
Average board tenure	-0.00	0.00	0.90
	(0.95)	(0.86)	
Board stock ownership	6.50	6.14	52.08
	(0.00)	(0.00)	
Board independence	-0.01	-0.01	-10.48
	(0.01)	(0.02)	
Lnsigma	0.08	0.03	
	(0.01)	(0.42)	
Constant	3.64	4.80	
	(0.00)	(0.00)	
Observations	4,464	4,464	4,464
Year FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Note: Robust p values in parentheses. Standard errors are robust and clustered at firm level. Model input had 5896 observations. Survival model drops observations that begin on or after the first failure i.e. observations after a CEO becomes board chair are dropped. Therefore, after those observations are dropped, 4464 observations remain. Moderators are centered. Marginal effects correspond to the effect of a discrete change for dummy variables or a standard deviation increase for continuous variables on the mean survival time. Marginal effects are evaluated at the mean of continuous variables and zero for dummy variables.

TABLE 5 AFT Survival Model of CEO Probation - Interactions

	Model 3	Model 3
Variables	**Full Model**	**Marginal Effects (%)**
IDD rejection	0.47	60.20
	(0.01)	
ROA	-0.77	-7.89
	(0.18)	
IDD rejection * ROA	1.38	
	(0.03)	
HHI	-1.20	-25.26
	(0.00)	
IDD rejection * HHI	-1.18	
	(0.00)	
Firm size	-0.20	-32.76
	(0.00)	
Firm leverage	0.92	18.96
	(0.00)	
CEO age	-0.03	-15.83
	(0.00)	
CEO external	0.18	8.76
	(0.06)	
CEO stock ownership	-14.45	-34.31
	(0.00)	
TMT size	-0.17	-18.20
	(0.00)	
Board size	0.04	9.90
	(0.04)	
Board female representation	-0.00	-3.21
	(0.50)	
Average board tenure	0.00	0.67
	(0.89)	
Board stock ownership	6.04	51.24
	(0.00)	
Board independence	-0.01	-10.66
	(0.02)	
Lnsigma	0.02	
	(0.61)	
Constant	4.56	
	(0.00)	
Observations	4,464	4,464
Year FE	Yes	Yes
State FE	Yes	Yes
Industry FE	Yes	Yes

Note: Robust p values in parentheses. Standard errors are robust and clustered at firm level. Model input had 5896 observations. Survival model drops observations that begin on or after the first failure i.e. observations after a CEO becomes board chair are dropped. Therefore, after those observations are dropped, 4464 observations remain. Moderators are centered. Marginal effects correspond to the effect of a discrete change for dummy variables or a standard deviation increase for continuous variables on the mean survival time. Marginal effects are evaluated at the mean of continuous variables and zero for dummy variables.

TABLE 6 Monthly level analysis - AFT survival analysis

	Model 4	Model 5	Model 6
Variables	**Focal variables only**	**Main effects only**	**Full Model**
IDD rejection	0.80	0.49	0.23
	(0.00)	(0.10)	(0.44)
HHI	1.86	3.76	3.77
	(0.14)	(0.08)	(0.05)
IDD rejection * HHI			-1.96
			(0.07)
ROA	0.45	4.30	-5.74
	(0.71)	(0.02)	(0.05)
IDD rejection * ROA			17.14
			(0.00)
Firm size		-0.95	-1.14
		(0.00)	(0.00)
Firm leverage		2.73	2.11
		(0.00)	(0.00)
CEO age		-0.07	-0.12
		(0.01)	(0.00)
CEO external		0.18	0.49
		(0.59)	(0.20)
CEO stock ownership		-18.82	5.12
		(0.21)	(0.57)
TMT size		0.24	0.12
		(0.08)	(0.19)
Board size		1.29	0.93
		(0.07)	(0.24)
Board female representation		0.03	0.01
		(0.14)	(0.66)
Average board tenure		0.13	0.14
		(0.02)	(0.01)
Board stock ownership		14.32	5.00
		(0.03)	(0.06)
Board independence		0.06	0.06
		(0.00)	(0.00)
Lnsigma	-0.42	-0.90	-1.06
	(0.00)	(0.00)	(0.00)
Constant	9.21	4.34	7.25
	(0.00)	(0.23)	(0.02)
Observations	549	549	549
Year and month FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Note: Robust p values in parentheses. Standard errors are robust and clustered at firm level. Moderators are centered. Firm size is the natural logarithm of the one plus total number of employees in thousands. Board size is the natural logarithm of total number of directors on the board of a firm in a year. The sample size is very small and the model doesn't converge. I try different operationalization of control variables to get the model to converge.

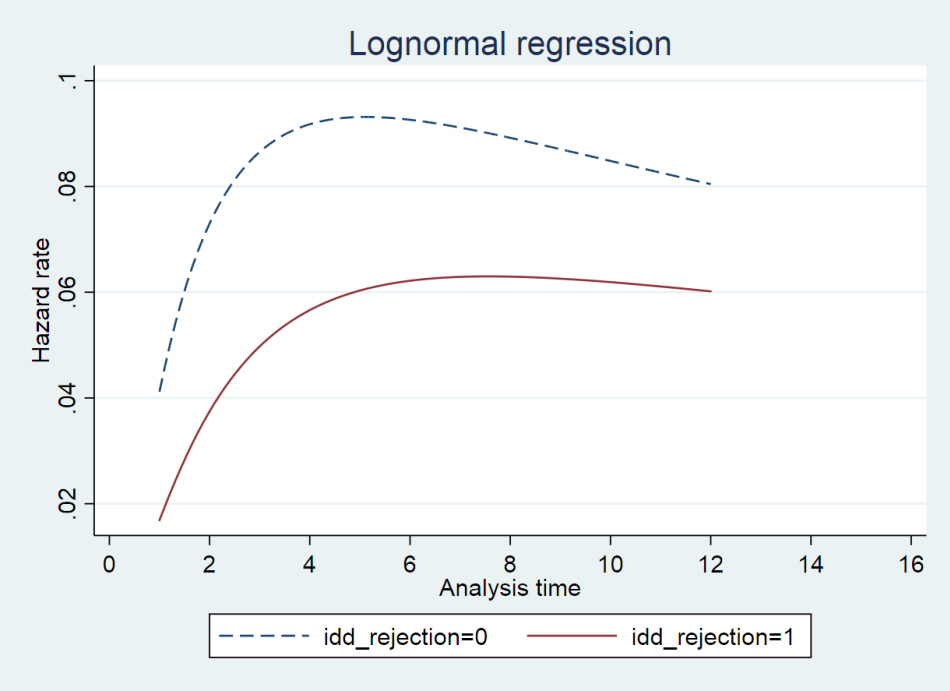

FIGURE 1 Comparative hazard function graphs for IDD rejection and non-rejection. Hazard indicates the instantaneous failure rate of an event i.e. the probability of failure at time t, given that the event didn't occur until t. Here, hazard indicates the probability of CEO-board chair combination at time t, given that the CEO did not become board chair until t. The risk of CEO becoming the board chair increases in the initial years of CEO appointment reaching a peak and decreases with time. Further, supporting the main hypothesis H_1, after IDD rejection the risk of CEO becoming board chair is lower indicating higher time to board chair.

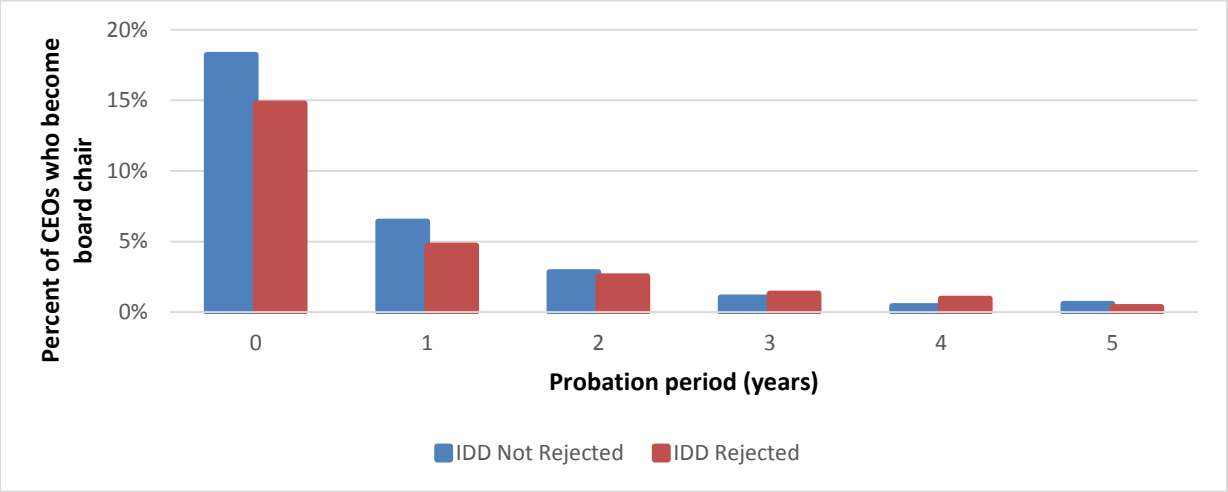

FIGURE 2 Comparing probation period vs percentage of CEOs made board chairs between IDD rejected and non-rejected samples

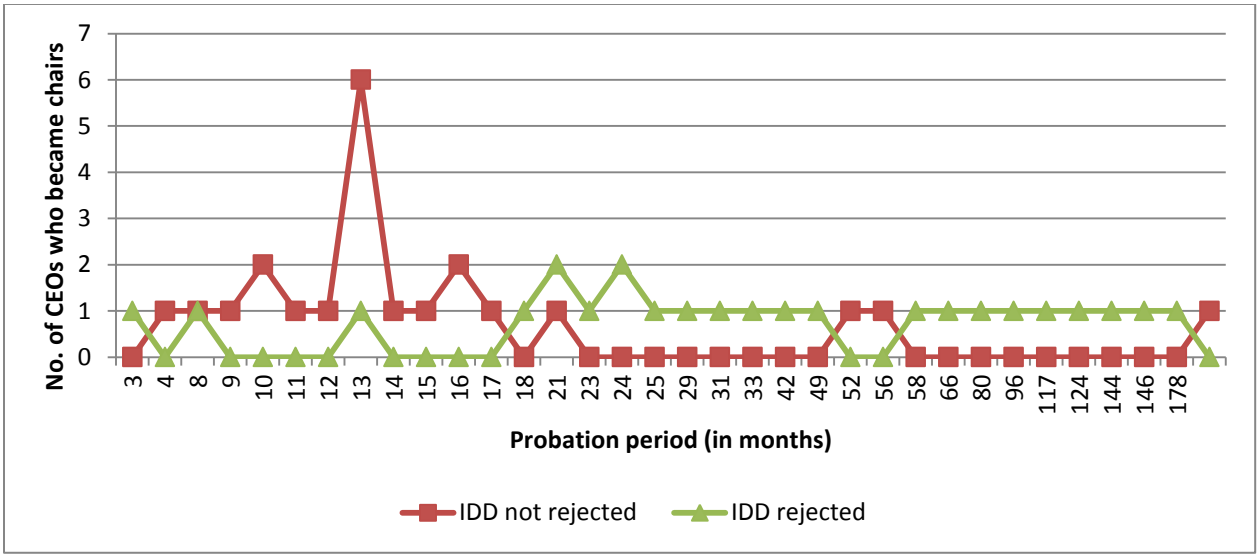

FIGURE 3 Comparing probation period vs count of CEOs made chairs between IDD rejected and non-rejected samples